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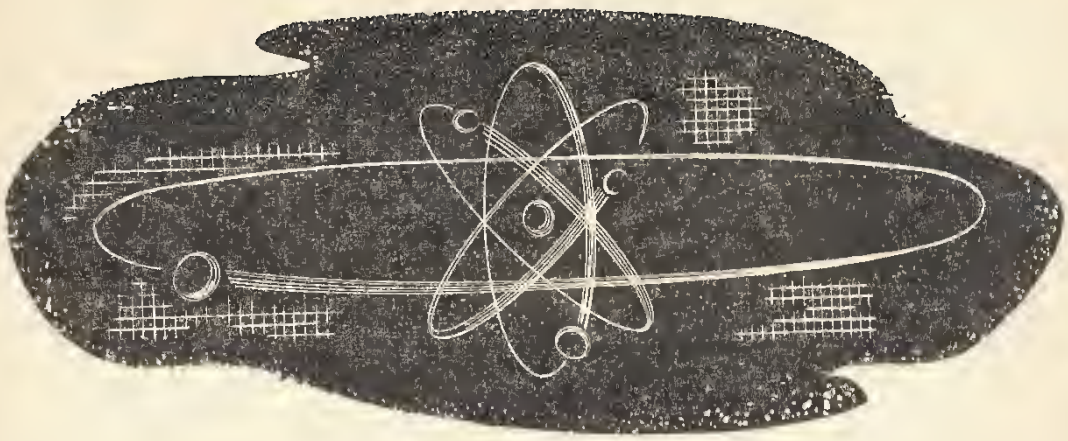


THE REAL PUSHBUTTON WARFARE

The official announcement of the obviously inevitable having been made—some months back now; we are not a news magazine, of course—we are, in reality, operating in the world political situation that was clearly predictable. A divided world with atomic weapons. And the trouble is not with atoms, nor with the laws of the universe. Nature's not nationalistic; she'll answer any properly phrased question asked by any intelligent being anywhere in the universe. The trouble doesn't lie there.

The trouble is pushbutton warfare, and I do *not* mean the pushbuttons made of plastic and metal by which rockets are launched, or subcritical masses combined to annihilation. I mean those far more deadly pushbuttons that already exist, all over the world—pushbuttons that have controlled the most deadly of all weapons for many, many years. They're man-made pushbuttons, too—but they're the pushbuttons that set off men's minds.

Oscar Hammerstein II has a fine, bitter verse in "South Pacific" in the song "Carefully Taught" that goes:

You've got to be taught
Before it's too late,
Before you are six, or seven or eight,
To hate all the people your relatives hate;
*You've got to be carefully taught.**

This is the way those man-made pushbuttons are made. The United States has the world's greatest industrial machine; we mass-produce automobiles for people to ride in, beds to sleep in, even houses to live in, and television sets to enjoy. More recently the United States has gone into mass-production, assembly-line techniques on atomic bombs. But the greatest mass-production ma-

chine for producing those deadly pushbuttons is, unfortunately, not under our control. We do have a few small-scale, handicraft type producers. Their pushbuttons are rather poorly made, and relatively weak, as a matter of fact. It takes the power of a great machine to turn out a really strong, efficient product. Some individuals accidentally acquire a pushbutton which has the label "I've got to kill him before he kills me!"; when that one is pushed properly, we have a homicidal maniac. Usually the unfortunate individual has no more powerful means at his disposal than clubs, knives or pistols. Occasionally he succeeds in setting up an efficient mass-production machine for turning out duplicates of his own pushbutton model; then we have a Hitler, and more powerful weapons are at his disposal. The mass-production pushbutton has now been harnessed to mass-production death.

There are many varieties of labels on those pushbuttons, but all of them are wired—quite invisibly, of course—to human brains. And when the pushbutton is pressed, man—or men—jump. The big mass-production factories turn out ganged buttons, so that millions of men can be made to jump to one single push. It takes a big, government-financed and government-controlled outfit to turn out that kind, though.

That's the trouble with democracy, I guess. We have only a few imported types of pushbuttons and a few made by small-scale local producers turning out an inferior product. The only well-organized pushbutton producers in this country are frittering away their time with such unimportant things as teaching people to laugh en masse. Some, even, are going to the outrageous extreme of teaching people how to disconnect pushbuttons that have been so carefully taught into them. But most of the really effective pushbuttons in the country are imported. Our local producers have the sad habit of going into strictly competitive production; their efforts are largely nullified by mutual competition.

These carefully taught pushbuttons are the only kind that are really dangerous to Man; the metal and plastic kind aren't any good at all, the great intercontinental bombardment rockets, the subcritical masses of uranium and plutonium are all useless—unless a man who has been carefully taught is there to push them. And the man won't be, unless a whole population has been carefully taught, with plenty of pushbuttons installed in that deadliest of all weapons—the human mind.

We have a tremendous lead in production of atomic weapons, and in the technology of machine production.

But our production of mind pushbuttons is a small and feeble, and unco-ordinated, effort indeed.

The world does not need a defense against atomic bombs. We need a science that will turn off and rip out those pushbuttons.

The Editor.

THE Xi EFFECT

BY PHILIP LATHAM

If time slowed down to a standstill, the world wouldn't come to an end with a roar—rather, perhaps with a whimper . . .

Illustrated by Orban

For a week the team of Stoddard and Arnold had met with nothing but trouble in their solar infrared exploration program. First the lead sulfide photo-conductive cell had refused to function. Next an electrical storm—practically unknown in September—had put a crimp in the power line to the mountain observatory. And now for some wholly inexplicable reason the automatic recorder stubbornly refused to register a single quantum of radiation beyond 20,000 A.

"Here's the end of the atmospheric carbon dioxide band at sixteen thousand," said Arnold, indicating a point on their last record sheet. "You can see everything's all right out to there. But beyond twenty thousand we aren't getting a thing."

Stoddard grunted, "That's what comes of our big economy drive. Trying to cut expenses by buying from the dime store." He walked over to the spectrometer and regarded it gloomily. It was the product of his own mind, an impressive series of slits and parabolic mirrors fed by a beam of sunlight from the top of the tower. When the optical setup was in perfect adjustment the apparatus would bring just the desired band of infrared radiation onto the sensitive surface of the photo-conductive cell. But obviously all was not in perfect adjustment.

"Maybe it's in the amplifier this time," Arnold suggested hopefully.

"Well, that's the only part of this contraption that hasn't balked on us so far," said Stoddard. "Suppose you look it over while I check the cell again."

For the next hour the astronomers probed the interior of the spectrometer as intently as two surgeons performing an exploratory laparotomy,

passing tools back and forth and generally anticipating each other's wants with scarcely a word spoken. For fifteen years they had thus worked together, one of the oddest looking scientific teams at the Western Institute of Technology, but one that had also proven itself amazingly productive. Stoddard at forty had the general shape of an old-fashioned beer barrel, with big hands, big feet, and a big protruding stomach. His half-closed eyes gave him a perpetually sleepy expression, a highly effective mask for one of the keenest minds in the business. Arnold, although nearly as old as his partner, somehow still gave the impression of youth. He was small and slight with an eager boyish expression that often caused visitors to mistake him for a graduate student embarking on his first research problem. Stoddard was the practical man of the firm who designed the apparatus for their various investigations and took the bulk of the observations. Arnold was the one who reduced the observations

and discussed their theoretical significance.

"Find anything wrong?" Stoddard inquired at length, straightening up and replacing the cover that housed the cell assembly.

"Nothing worth mentioning," said Arnold. "Think there's time for another run?"

"Yeah, I guess so. Put the sun back on the slit and we'll take another crack at her anyhow."

But the second run proved no better than the first; in fact, if anything the cutoff occurred a trifle farther in toward the violet than before.

"I might as well take the whole works down to the laboratory for a complete overhaul," Stoddard declared, looking at his brain-child as if he would like to heave it over the side of the mountain. He watched a cloud drift lazily across the disk of the sun projected against the slit. "Get any weather predictions on the radio this morning?"

Arnold gave him a quizzical glance. "Haven't you heard yet? All the radio stations have been dead for more than a week."

"What's the matter with 'em?"

"Well, it's really quite mysterious. Last Monday KLX faded out right in the middle of a program, and then stations farther up the dial began to be hit one after the other. For awhile all you could get were the amateurs and the police department. Now they're dead, too."

Stoddard, who regarded the radio as one of the major threats to his peace of mind, took the news philosophically. "Well, I'm glad to hear we aren't the only ones having trouble these days. But I'll bet my wife was sore when she couldn't hear what happened to Priscilla Lane, Private Secretary, last night."

Stoddard was in his laboratory in the basement of the Astrophysics Building at Western Tech hard at work on the wiring diagram for the amplifier system when Arnold came breezing in, his bright young face aglow with enthusiasm.

"Guess what?" he exclaimed. "Friedmann's in town. He's agreed to give a talk this afternoon in Dickinson Hall on his theory of the Xi effect. You know Friedmann, don't you?"

Stoddard shook his head. "Never heard of him."

Arnold hooked one leg over the corner of the desk. "Well, in my opinion he's the foremost cosmologist in the world today. He had so much trouble getting published at first that his reputation isn't as big as it should be. Everybody thought his first paper was written by some crank until Eddington saw it and recognized its value immediately. Now Friedmann won't send his articles to any of the regular journals. You've got to dig his stuff out of all sorts of queer places, like the *Proceedings of the Geophysical Society of Venezuela* or the *Annals of the Portuguese Meteorological Union.*"

"I know how he feels," said Stoddard sympathetically.

"Well, I thought we should hear

him because his theory might possibly have some bearing on our infrared observations last week."

"Think I could understand him if I did hear him?"

"Oh, probably not but then that goes for a lot of the rest of us, too."

Stoddard reached for the wiring diagram. "Well, I'll see if I can manage it. But you know what I think of these high-powered theoretical fellows."

Arnold laughed. "I've been briefed on that before." He got up and started for the door. "Room 201 at four-thirty. I'll save a seat for you."

The meeting was already in progress when Stoddard opened the door and slippd to his seat without creating any more commotion than a horse backing into a stall. As usual, the front rows were occupied by the hardened campaigners among the faculty, the grizzled veterans of a thousand seminars: Fosberg and Ballantyne from the math department, Blacker and Tinsdale from the radiation laboratory, and Denning the nuclear physicist. The remainder of the audience in the rear was composed of a miscellaneous rabble of graduate students and professors from neighboring institutions of learning and culture.

"Who's ahead?" asked Stoddard, sinking into the chair beside his partner.

"You should have heard Friedmann put old Blacker in his place a minute ago," Arnold whispered with evident relish. "He sure slapped him down plenty that time."

To Stoddard, all theoretical physicists were strange creatures far removed from the rest of mankind. It was his experience that they could be divided with remarkable uniformity into two types, A and B. A typical specimen of Type A, for example, is mentally accessible only with the greatest difficulty. As a general rule, he moves through life with the vague detached air of a confirmed somnambulist. Should you summon the courage to ask his opinion on a paper, he regards it with much the same expression of critical disapproval that a secondhand car dealer instinctively assumes when inspecting a battered automobile brought in for sale. Everything is in a pretty bad state. It is possible, however, that a little progress may be made along the following lines, et cetera. A pure Type B, on the other hand, gives the impression of being always on the point of boiling over. He trembles with suppressed excitement. One of his former pupils has just proposed a theory that constitutes a tremendous advance. Where there was only darkness before now all is sunshine and light. As soon as a few odds and ends are cleared up the whole problem will be practically solved, et cetera, et cetera.

Stoddard classified Friedmann as predominantly Type A with a few overtones of Type B thrown in. He was a tall, thin man of about thirty, with sharp angular features, and a way of looking at you as if his eyes were focused on a point ten feet be-

hind your back. His voice was dry and flat with the barest trace of foreign accent.

Stoddard had not listened for more than five minutes before he began to experience the same sense of bewilderment that little Dorothy must have felt on her first trip to the land of Oz. As nearly as he could gather, Friedmann considered the familiar everyday world to constitute merely a tiny corner or "clot" in a vastly higher order of space-time or "Xi space." Ordinarily, events in the Xi space are on too gross a scale to exert a sensible effect on the fine-grained clot space. On rare occasions, however, a clot might be seriously disturbed by events of an exceptional nature in the Xi space, in somewhat the same way that the atoms on the surface of a stick of amber may be disturbed by rubbing it vigorously. When events in the super-cosmos happen to intrude upon an individual clot extraordinary results ensue; for example, angular momentum is not strictly conserved, and Hamilton's equations require modification, to mention only a few.

"Thus for a properly oriented observer the universe must at all times have a radius equal to tau times the velocity of light," said Friedmann, by way of conclusion. "Hence, if tau increases uniformly we must of necessity have the expanding universe as shown by the general recession of the extragalactic nebulae.

"But this increase in tau time is not really uniform but a statistical effect. Local fluctuations in the Xi space may attain such magnitude as to become distinctly perceptible in clot space. Evidence for the Xi effect in our vicinity is shown by the behavior of the Andromeda nebula, which instead of sharing in the general recession is approaching the Earth at three hundred kilometers per second. Again, certain anomalies in the motion of the inner planets, notably the secular variation in the node of Venus,* clearly indicate encroachment of the Xi effect within the confines of our own solar system. Further anomalies of increasing magnitude may be anticipated."

With a curt nod he gathered together his papers and sat down abruptly, scarcely bothering to acknowledge the prolonged applause from the student section. The secretary of the Astronomy and Physics Club thanked Dr. Friedmann for his address which he was sure they had all enjoyed, and inquired if there were any questions. This announcement was followed by the customary minute of awkward silence. Finally the spell was broken by Fosberg, an authority on the theory of numbers and uncrowned king of the faculty's eccentric characters.

"As I get it, this postulated Xi

*The outstanding difference between gravitational theory and observation is the well-known discrepancy of 43" per century in the motion of the perihelion of Mercury. Einstein's explanation of this discrepancy was considered a triumph for relativity.

The next largest difference between gravitational theory and observation is the secular variation of 13" per century in the node of Venus, which has not been explained by relativity. See *Journal of the Optical Society of America*, vol. 30, p. 225, 1930.

effect started a shrinkage in our sector about ten-to-the-ninth years ago. Now then, I've just been doing some figuring on the back of this envelope and if I haven't made a mistake the present diameter of the solar system out to Pluto is 3.2×10^8 kilometers, or about two hundred million miles. Is that right?" Everyone looked expectantly at the speaker.

"I work entirely with the generalized formulae; never with numerical values," Friedmann replied with cold dignity. "However, I do not question the accuracy of Dr. Fosberg's arithmetic. Naturally the shrinkage would be quite imperceptible with ordinary measuring rods. It would be necessary to make some observation involving explicitly the velocity of light."

"I'm willing to grant you that," Fosberg returned, "but aren't you going to get into serious trouble with the law of gravitation due to all this shrinkage? Why, in a few more years the congestion in the solar system will be worse than the campus parking problem!" It was a remark that was always good for a laugh and one of the principal reasons he had asked the question in the first place.

"The gravitational difficulties that so worry Dr. Fosberg do not follow as a necessary consequence," said Friedmann, entirely unruffled. "As I have demonstrated, the laws of Newtonian mechanics may fail to hold even as a first approximation. At these extreme limits, however, the integration of the equations becomes quite insuperable by ordinary methods. One of my pupils at the University of Pennsylvania plans to explore these regions next year with the EDVAC."

Fosberg wagged his bald head. "Just the same all this crowding together still worries me," he declared. "And I don't like the idea of being reduced to the size of a microcosmic midget either."

Friedmann's shrug plainly indicated that it was a matter of complete indifference to him if Fosberg were reduced to the dimensions of a neutrino, and as there were no more questions, the meeting broke up. Stoddard, who had grown thoroughly bored with the whole proceedings, made a bolt for the door but Arnold was only a few lengths behind.

"Wasn't Friedmann good," he demanded. "Don't you think it's the most satisfying cosmological theory you ever heard?"

"No doubt about it," said Stoddard, continuing on down the hall.

"You know, I was thinking," Arnold went on, falling into step beside him, "why couldn't we test the Xi effect ourselves?"

"Test it ourselves!"

"Why not? After all, it shouldn't be too difficult. As Friedmann said, we would only need to make some observation that depends explicitly on the velocity of light."

Stoddard snorted. "Bet he's never made a bona fide observation in his whole life."

They stopped on the steps outside Dickinson Hall before wending their separate ways homeward. The sun

had set and a slight breeze was beginning to stir the leaves of the giant oak tree at the entrance.

"Well, the next time you're in my office we'll have a long talk about it," said Stoddard, edging down the steps. "But right now I've got to get home for dinner."

"The observation would consist simply in determining whether some distant event occurred at the time predicted," Arnold mused. "Let's see, what would be the easiest thing to observe?"

At that instant his eye was attracted to a star faintly visible near the eastern horizon. "I've got it!" he cried. "We could observe an eclipse of one of Jupiter's satellites. If the solar system has really shrunk as much as the Xi effect predicts, it should occur way ahead of time."

"You mean do a kind of repeat on Roemer's work," said Stoddard, "only with a light time corresponding to the whole distance to Jupiter instead of the diameter of the Earth's orbit?"

"Exactly!"

Stoddard could feel the net closing around him. He knew that once his partner in crime became infatuated with an idea it was useless to try to discourage him. "Well, I guess we've looked for less hopeful things. Only I can't seem to remember what they were."

"Listen," said Arnold, his eyes shining, "is there a class at the ten-inch tonight?"

Stoddard considered, "This is Wednesday, isn't it? Nope, don't think there will be one."

"Then what's to stop us from making the observation right now—tonight?"

"Nothing, so far as I know, except maybe a nice thick fog." He heaved a sigh of resignation. "Come on, let's take a look at the *Ephemeris*. Maybe there *aren't* any eclipses tonight."

But the *American Ephemeris* said otherwise. An occultation of Jupiter I was scheduled for Thursday, October 5th, at four hours eight minutes and ten seconds of Greenwich Civil Time.

Arnold was delighted. "I'll meet you at the ten-inch at seven-fifteen tonight. O.K.?"

"O.K."

"We can stop in at my house for a drink afterward."

"We'll probably need one," was Stoddard's grim comment, "after we find out how much the universe has shrunk."

The lamp over the desk threw grotesque shadows around the circular room making the telescope and pier look like some giant insect flattened against the curving walls of the dome. At that moment, however, Stoddard was in no mood to appreciate the projective geometry of shadow pictures. Like all other manually operated observatory domes in the world, the one on the ten-inch at Western Tech opened only with the utmost reluctance. At length in response to an effort worthy of superman, Stoddard forced the

shutter back revealing the constellation of Cygnus sprawling across the meridian. Breathing heavily, he turned the dome until Jupiter came into the center of the opening, a gleaming yellow stoplight among the faint stars of Aquarius. Then swinging the telescope around on the pier as if it were an antiaircraft gun, he sighted along the tube until the planet came darting into the field of view.

"How's the seeing?" asked Arnold, a formless black shape by the desk. He twisted the shade over the lamp until the light illuminated the chronometer and pad of paper at his elbow but left the end of the telescope in shadow.

Stoddard gave the focusing screw another touch. "Not so good," he muttered. Removing the eyepiece from the end of the telescope he substituted a longer one in its place from the box beside him. "There—that's better."

"How do the satellites look?"

"Well, just about the way the *Ephemeris* predicted. Callisto and Ganymede are over on the west. Europa's about a diameter of Jupiter to the east. Io doesn't seem to be anywhere around."

He lowered the seat on the observing platform a couple of notches thus enabling him to look into the telescope with less strain on his vertebrae. "Wait a minute—caught a glimpse of her at the limb just then."

Arnold shot a glance at the chronometer. "Gosh. don't tell me it's going into occultation already!"

"Well, it sure looks like it."

"But it can't be that much ahead of time."

"Why not? That's what you were hoping for, wasn't it? Keep an eye on the chronometer, anyhow. I'll give you the time as close as I can in this bum seeing."

For several minutes the dome was silent except for the steady ticking of the chronometer and the low hum of traffic from Los Feliz Boulevard far below. Stoddard concentrated his every faculty on the tiny point of light projecting from the planet's disk. Sometimes he felt sure it must be gone only to have it flash into view again. He waited until it had remained out of sight for an unusually long interval. "All right, get ready," he warned. "Now!"

"Seven - thirty - three - zero - zero," said Arnold, writing down the numbers at the top of the record sheet. Stoddard rose painfully from his cramped position at the end of the telescope and began cautiously exercising one leg. His partner continued figuring busily for another five minutes. Presently he leaned back and began tapping the desk thoughtfully with the tip of his pencil.

"What's the answer?" said Stoddard, limping across the room.

"Well, according to these figures," Arnold replied, speaking with elaborate casualness, "the occultation occurred just thirty-five minutes and ten seconds ahead of time."

For a moment neither spoke. Then Stoddard let out a belly laugh that shattered the peaceful calm that had hitherto enveloped Observatory Hill.

"That puts Jupiter right in our backyard. It's so close the light gets here in nothing flat."

Arnold gazed up at the planet riding so serenely among the stars. There were Vega and Altair over in the west, with Cygnus flying close behind, and the great square of Pegasus wheeling upward in the north, precisely as he had seen them a thousand times before. Could it be possible that some catastrophe from Outside had warped their little corner of space until the giant Jupiter had been brought to what would once have been an arm's length, so close you might have reached out and seized it between your thumb and forefinger like a cherry? As a boy he had loved to read tales of time travel and flights to other planets, and the feeling that something transcendental was lurking around the corner had never entirely left him. In their seminars they talked of world lines and a space of n dimensions but did any of them really believe it? Now perhaps it was here at last. He shivered in the damp night air. The ocean breeze blowing in through the dome certainly felt real enough.

Mechanically he began helping Stoddard put the telescope to bed for the night, replacing the cap on the objective and swinging the telescope over the polar axis, where he clamped it in declination.

"What do you say we go down in the darkroom for a smoke?" said Stoddard, when everything was shipshape. "I'd like to take a look at those figures of yours myself."

The darkroom in the basement below was a welcome relief from the windy dome. Stoddard threw off his jacket, pulled a stool up to the bench that ran down one side of the room, and began stoking his pipe from a can of tobacco in one of the drawers. Not until this operation was completed to his entire satisfaction, and the bowl glowing brightly, did he turn his attention to Arnold's reduction. Then with exasperating deliberation he started checking off the figures, pausing occasionally between puffs to compare them with those in the *Ephemeris*. Arnold leaned against the wall watching him nervously.

"Well, I can't seem to find anything wrong," he admitted grudgingly, "but, of course, that doesn't mean it's right, either."

Taking careful aim, he blew a smoke ring at the girl on the calendar over the sink, watching it swirl around her plunging neckline with moody satisfaction. "A dozen times in my life I've got results almost as crazy as this one. Every time I couldn't help saying to myself, 'Stoddard, maybe you've discovered something at last. Maybe you've stumbled onto something big.' So far I've never made a single scientific discovery.

"Now you take this observation tonight. Sure, it would be exciting to suppose the solar system has shrunk to the size of a dime, but first I want to be absolutely sure there

isn't some perfectly natural commonplace explanation. It's a depressing fact that most of the exciting results a scientist gets can eventually be traced to errors of observation. Think of all the times Mira Ceti at maximum has been mistaken for a nova."

"Everybody knows that," Arnold objected. "But where's the chance for error in this observation? It's so simple."

"Maybe not so simple as you think. Remember the seeing was terrible. That time I gave you might have been off by a couple of minutes—maybe more."

"That still leaves thirty minutes to explain."

"All right. Now the question is how much faith can we put in the *Ephemeris?* It wouldn't surprise me if the predicted time itself was way off."

"As much as that?"

"Well, I know the predictions for Jupiter's four great satellites are based on Sampson's tables of 1910, and they certainly must require some kind of correction by this time. I don't know how often the Naval Observatory checks up on things like that. But until we do know—and have a lot more observations—we really don't know a thing."

"O.K., O.K.," said Arnold impatiently. "All the same, I still think it's a whale of an error."

"It's a king size one, I'll admit," said Stoddard, relighting his pipe. "And now there's something I wish you'd explain to me. After all that palaver this afternoon I still don't understand how this so-called Xi effect ties in with our infrared observations."

Arnold reached for the pencil and a pad of yellow scratch paper. "Assume that this line represents the boundary of our local universe or 'clot'," he said, drawing an irregular closed figure with a dot near the center. "According to Friedmann, occasionally some disturbance in the outer super-cosmos or Xi space becomes sufficiently violent to affect a particular clot. Now there are several things that can happen as a result, but by far the most probable is that the clot will begin to shrink, very slowly at first and then more rapidly. But for a long time nobody would be aware of the shrinkage because everything within the clot shrinks in proportion, with one exception. That exception is the wave length of electromagnetic radiation.

"Suppose the boundary has shrunk until it has an average radius of a thousand kilometers." He drew a line from the central dot to a point on the boundary. "Obviously nothing can exist within the boundary bigger than the boundary itself. Therefore, this means that all electromagnetic radiation exceeding a thousand kilometers is eliminated. That accounts for the fadeout in radio transmission. As the boundary continues to shrink shorter wave lengths keep being cut out all the time."

"I think I'm beginning to get it,"

said Stoddard, studying the diagram. "We didn't get any transmission beyond twenty thousand angstroms because there wasn't any radiation to transmit."

"That's it! Our universe only had a diameter of twenty thousand angstroms. All radiation of longer wave length was cut out."

"About one ten-thousandth of an inch," said Stoddard, doing some fast mental arithmetic. He chuckled. "No wonder old Fosberg was worried!"

"You see the Xi effect does give a consistent explanation of all the phenomena," said Arnold triumphantly. "In any case, we can't be in doubt much longer."

"How's that?"

"Why because the universe will have shrunk so much the optical spectrum will be affected. The landscape will change color."

"Well, maybe you're right," Stoddard agreed reluctantly, "but so far everything looks just the same to me as it always has." Absently he began doodling a series of circles and squares across Arnold's diagram. "What I wish," he said with a yawn, "is that somebody would find a way to shorten the time from one pay day till the next."

Arnold waved his arms in a helpless gesture and walked to the other end of the room. Stoddard sat motionless as if half asleep. Presently he took a brief case from one of the drawers and began exploring its contents. "Here're those snapshots we took at the zoo the other day," he said. "Haven't had time to develop 'em yet."

His partner eyed the rolls of film without interest. "My wife was asking about them at dinner. She wants to see that one where she's feeding the eagle."

"If you want to wait, I can develop 'em now."

Arnold glanced at his wrist watch. "Sure, go ahead. It's only eight-thirty."

Stoddard turned off the overhead light plunging the little room into total darkness. Arnold could hear him searching for the switch that operated the safelight, but when he snapped it on there was no result. He snapped it several times but still without result.

"Globe's probably burnt out," said Arnold.

Stoddard jerked the screen back revealing the light inside burning brightly. "Now what?" he muttered.

They stood staring at the light in puzzled silence. Suddenly Arnold leaned forward, his face tense in the white glare from the lamp.

"Stoddard."

"Yeah?"

"Put the screen back over the lamp."

His partner hesitated then obediently shoved the screen back in place until not a chink of white light was visible. Gradually as their eyes gained sensitivity in the dark the oblong shape of the safety screen became faintly visible.

But the screen was no longer ruby red. It was a dull colorless gray.

No scientific theory ever became accepted as fact so quickly as Friedmann's theory of the Xi effect, but then no other theory before ever had such a convincing array of scientific evidence to support it. The change in the tint of the landscape that Arnold had foreseen eventually developed but for several weeks it was too slight to be readily obvious. The effect was the same as if everyone had gone color-blind to an effective wave length of about 6500A. It was disconcerting to find that your hedge of geraniums was black instead of scarlet, and the absence of stoplights was nearly disastrous. Some women became violently hysterical when they first beheld the inky fluid oozing from their veins. But after the novelty had worn off the public soon lost interest. They had lived through the invasion from Mars, the flying saucers, and other scientific gags, and doubtless in time this, too, would pass. Besides, how could you expect people to work up any enthusiasm over something when they weren't even sure how to pronounce it?

But as orange and yellow followed red into the gray there came a change in the public attitude, a kind of half-credulous belief mingled with misgiving and dismay. Men still laughed and joked about the Xi effect over their old-fashioneds at the country club, but just when everybody was

feeling happy and secure again someone was sure to spoil it all. "You know this thing may turn out to be more serious than we think," he would say. "I've got a nephew teaches out at the university. Hasn't got a dime but smart as the devil. Well, he told me confidentially it's getting worse instead of better. No telling where it may end, in fact."

Rather curiously, women had much more awareness of the Xi effect than men, for it struck at their most vulnerable point—their appearance. Golden hair could turn gray in a matter of weeks. A complexion drained of its warm flesh tints looked dead. Cosmetics were of no avail against it. For of what use was lipstick if it only turned the lips from gray to black? Or of rouge if it left only deeper shadows on the cheeks? The radiant beauty of a short time past anxiously examining her face in her mirror at night might see an old woman staring back at her out of the glass. Deaths from sleeping pills became a commonplace.

Not until late in November, however, did the situation reach such a critical stage that government officials felt compelled to recognize the Xi effect as a definite world menace. Previously its encroachment had been dismissed by the ingenious process of studiously minimizing its existence. It was true that the papers printed the censored reports from scientific institutions but always under captions that were misleading and with the significant news buried near the bottom of the column. A few scientists who refused to be muzzled soon found themselves out of a job or called up before an investigating committee.

Eventually, however, the clamor became so loud that announcement was made of a series of mass meetings to be held across the country in which all the facts insofar as they were known would be discussed without reservation. The first in the series was scheduled for the Los Angeles Coliseum for Monday, November 27th, with the great Dr. Friedmann as the feature speaker of the evening. Public sentiment changed almost overnight. The personal appearance of Friedmann alone did much to restore confidnce. He was the fellow who had discovered this Xi effect, wasn't he? Well, then, he could probably control it, too. Man had never met a problem that man was unable to solve.

By the evening of the 27th public curiosity over what Friedmann would say had been excited to such a degree, that it was necessary to keep the man's whereabouts a profound secret to prevent him from being mobbed on sight. By five o'clock every street leading toward the coliseum was blocked solid with cars for miles around, and by seven o'clock more than a hundred thousand people had jammed themselves into the vast structure, while thousands more milled around the walls outside seeking entrance. Although the Los Angeles Police Department had every man available on duty in

addition to two hundred special officers hired from outlying districts, they were able to maintain order only with considerable difficulty. An attitude of reckless abandon was manifest even among ordinarily well-behaved individuals. It was a holiday crowd without the holiday spirit.

"I'm not at all sure Friedmann is the best man to talk to these people tonight," said Arnold, standing up and gazing uneasily around him at the throngs still climbing up and down the aisles in search of seats. "They've come here confidently expecting to be told something that sounds nice and reassuring and instead Friedmann will simply hand them the hard cold facts. We scientists have known the truth for weeks and had a chance to become reconciled to it. But what about the average man whose cosmic outlook is limited to his job and the mortgage on his home out in Brentwood?"

"Be quite a blow to 'em probably," said Stoddard, biting into his hot dog. "Trouble with these theoretical fellows is they act as if the Xi effect had been invented for the sole purpose of letting them test out all their screwy ideas on nuclear structure."

Arnold sat down and began studying his program. "I see Atchison Kane is going to speak, too."

"Atchison Kane. Who's he?"

"Shakespearean actor," Arnold replied. Long ago he had become accustomed to his partner's splendid state of isolation from the world of the stage and screen. "Made a big hit in 'Richard the Third' recently. I heard him at the Philharmonic last August."

"That so?" said Stoddard. For the tenth time he looked at the great clock over the archway at the east entrance. "What's holding up the procession, anyhow? They were supposed to kickoff half an hour ago."

Others besides Stoddard were getting impatient. So far the crowd had been fairly well-behaved but now it was growing decidedly restless. Someone yelled, "We want Friedmann!" and in an instant thousands of voices were repeating the words over and over in a kind of savage chant. When this failed to produce results, a mob of boys acting as if upon signal, leaped over the parapet onto the field toward the speakers' stand. Before the police could intervene they began tearing down the decorations and smashing the chairs and railing. The dozen or so officers in the vicinity were overwhelmed at first but reinforcements soon gained the upperhand. The crowd was delighted, following every incident of the struggle with fascinated attention. Several men were knocked down and trampled in the melee, or sent reeling from the battle bleeding from lacerations around the head. Suddenly a great shout went up. The speakers surrounded by a husky squad of police were spotted emerging from the south entrance. Interest in the fight evaporated immediately. The floodlights were dimmed

and an expectant hush fell over the assemblage.

After the usual preliminaries, to which no one paid the slightest attention, the chairman of the National Scientific Security Council finally got around to introducing the main speaker.

"In the brief span that this committee has been in existence, citizens from all parts of the southland have been besieging us with questions concerning this effect which has been uppermost in the thoughts of each and everyone of us during these last troubled days. Unfortunately, no funds were appropriated for the purpose of answering these questions. And yet as representatives of the people we felt in all sincerity that they could not and must not be ignored."

The burst of applause at this point forced him to halt briefly until quiet reigned again and he was able to gather himself together for another effort.

"In view of this situation, my colleagues and I, after due deliberation, have asked our distinguished speaker if in lieu of a formal address he would consent to answer a set of representative questions selected by the committee. To this request I am happy to say that our speaker has most willingly and graciously given his consent.

"And now without further ado, it is my great pleasure and privilege this evening to present to you a man whom I am sure needs no introduction from me, that renowned scientist and scholar, Dr. Karl Gustav Friedmann."

From the uproarious applause that greeted Friedmann as he stepped to the front of the platform, it might have been supposed that he had discovered another Santa Claus instead of an effect that was relentlessly extinguishing the light of the world. He shook hands with the chairman, bowed a few degrees in the general direction of the crowd, and then stood quietly waiting for the tumult to subside. The chairman nervously riffled through the cards in his hand, selected one, and peered at it through his bifocals.

"Our first qustion is from a housewife in Long Beach," he announced. "She says, 'My husband has lost his job as radio salesman on account of the Xi effect. How soon will it be over so he can go back to work again?' "

Friedmann's voice was as unemotional as if he were lecturing half a dozen sleepy students rather than a crowd of a hundred thousand that were hanging on his every word. "I think that question may be answered by reading a message from the National Bureau of Standards which was handed to me as I entered the coliseum here tonight. Here is the message: 'Spectroscopic laboratory reports sudden marked acceleration Xi effect. Cutoff 5500 at 0000 GCT.' Now in plain language what does this mean? It means that at four o'clock this afternoon the extinction of radiation extended nearly to the

green." He hesitated. "I regret to inform the lady that her husband will never be able to return to his work. Why? Because so little while is left to us that no time remains for either work or play."

An excited uneasy murmur swept around the coliseum that rose to a sharp peak then hastily died away as the chairman selected another card. "Our second question is from a man in Pomona who signs himself 'Taxpayer'. His letter is too long to read in full so that I must confine myself to his inquiry at the end. 'If scientists knew light was going to be extinguished, then why didn't they get busy and do something about it a long time ago? The government makes me pay taxes so scientists can sit in their laboratories and hatch these wild theories. But when danger comes along they're just as helpless as the rest of us.' "

The letter provoked a good deal of laughter mingled with a surprising amount of handclapping. The humor of the situation, however, was wholly lost on Friedmann. "What would Mr. Taxpayer have the scientists do?" he demanded in a voice that was openly contemptuous. "Does he think they deliberately create the lightning that destroys a tree? Or the earthquake that engulfs a city? Well, I can assure him that these are nothing compared to the force that threatens us now. But before he criticizes science let him first learn something about it—go back to grammar school or read some little children's book."

There was a timid scattering of applause that was soon drowned in a chorus of boos and catcalls from all sides. One could sense the rising tide of resentment and frustration underneath.

"What did I tell you?" Arnold shouted. "They aren't going to take it."

Stoddard hunched down farther in his seat. "If you ask me all hell's going to break loose here in another minute."

Two members of the committee could be seen apparently expostulating with Friedmann, who stood listening to them indifferently with folded arms. The chairman was doing his best to restore order but it was nearly a minute before he was able to proceed. "Quiet please. Quiet," he entreated. "We have many more questions on the program of vital interest which I am sure you are all anxious to hear. Now here is one from a schoolteacher in Lynwood which goes straight to the point. 'Dear Dr. Friedmann, can you tell us what course of events we may expect from the Xi effect in the immediate future?' "

"There can be no doubt as to the course of events up to a certain point," Friedmann replied, speaking more slowly than usual and evidently weighing his words with care. "Beyond that point there is no knowledge, only speculation and conjecture.

"But in the immediate future the course of events is very clear. The

extinction of radiation will continue at a rapidly increasing pace. Soon the world will be completely devoid of the quality of radiation that excites the sensation of visible light. As it disappears, the sensation will be similar to that of watching a scene in a play in which the lights are gradually dimmed until finally the stage and players are utterly blotted out."

There was so much noise now that Arnold was able to hear only with the greatest difficulty. Some people stood yelling and shaking their fists at Friedmann while others shouted for them to sit down and let him proceed.

"After the visible radiation there remains the spectrum of the X-radiation and gamma rays," Friedmann continued, apparently unmindful that he had lost his audience. "Especially significant will be the nature of the reaction upon cosmic rays, a subject upon which scientists have been wholly unable to agree. At present there is no hope of securing records of this vitally important phenomenon. Furthermore, there is no hope—"

A whiskey bottle crashed against the stand showering Friedmann with glass. Another followed and another until the air was filled with them. A dozen fights were in progress within the coliseum while without a mob was attempting to break through the gate at the east entrance. In the distance could be heard the rising wail of police sirens.

Suddenly the floodlights blinked, wavered uncertainly, then slowly faded out to a chorus of anguished wails and frantic howls for lights. Whether the fadeout was by accident or intent the result was the same. A terrified panic-stricken hush descended upon the multitude.

It was at that instant a new voice was heard in the darkness; a voice calm and powerful, yet withal tender and reassuring.

"The Lord is my Shepherd; I shall not want."

In the dim light men and women looked at each other fearful and bewildered, as if a miracle were about to happen.

Again the voice came crying in the darkness. *"He maketh me to lie down in green pastures; He leadeth me beside the still waters."*

Arnold grabbed his partner by the shoulder. "It's Atchison Kane! If he can hold this crowd tonight, he's a wonder."

Men who were shouting and cursing a moment before now stood awed and irresolute. Here and there a few were beginning to kneel while others sobbed openly and unashamed.

"He restoreth my soul; He leadeth me in the paths of righteousness for His name's sake."

Many were beginning to repeat the familiar words after him. Now the voice swelled to a mighty climax in its message of faith and hope,

"Yea, though I walk through the valley of the shadow of death I will fear no evil—"

And then more softly,

"For Thou art with me; Thy rod and Thy staff they comfort me—"

From directly behind Arnold there came a woman's shriek with piercing intensity. It was a shriek filled with despair. A shriek that meant something was terribly wrong. Others around her began shouting and screaming too, pointing toward the great archway at the east entrance.

The low fog that had hung over the city all evening had broken momentarily revealing the rising moon. But it was a moon that no one there had ever seen before, a moon out of a nightmare, swollen and elongated as if viewed through a cylindrical lens. But even more unnatural than its shape was its *color*—a deep transparent blue.

Arnold was so intent upon the moon that he scarcely noticed when the floodlights came on again. Gradually he became aware of some change in the aspect of the coliseum itself; there seemed to be a soft waviness spreading everywhere warping some portions of the scene but leaving others untouched, like gelatin melting and flowing down a photographic plate. His eyes were unable to bring the mass of humanity banked against the opposite wall of the coliseum into sharp focus. The tiers of seats kept blurring and shimmering as if the light were coming from a great distance through layers of heated air.

With a sickening sensation he perceived that the distortion in space-time was beginning to affect objects right around him. The faces were undergoing some subtle alteration, noticeable particularly in the irregular position of the mouth with respect to the nose and eyes together with an apparent thickening and bending of the jaw and forehead, such as he had once seen in patients whose bony structure had undergone prolonged softening from osteitis deformons.

The night was deepening rapidly now closing in like the folds of a vast purple curtain. Simultaneously people were gripped by that primitive wholly unreasoning fear that is felt at a total solar eclipse the instant before totality, when the shadow of the moon suddenly looms on the horizon advancing with terrifying speed. Men and women clung to each other or ran frantically this way and that as if by fleeing they could escape a fate from which no escape was possible.

Stoddard and Arnold sat huddled together watching the groping figures grow dimmer and dimmer until the last ray of light was extinguished in the dense impenetrable blackness. But hours later they knew from the sound of voices and the pressure of hands and bodies, that thousands were still crouching in their seats waiting hopefully for the light that had always returned.

Arnold dozing against Stoddard's shoulder found himself repeating a phrase from Friedmann's last remark: "There is no hope— There is no hope—"

THE END

UNDESIRABLE ALIEN

BY DAVID MCCARTHY

He was not only undesirable; he was a menace to the peace and well-being of the community. He had to be watched, and got rid of before the whole system collapsed . . .

Illustrated by Cartier

They spotted him as soon as he came through the air lock from the spaceship landing ramp, outside. There was nothing extraordinary about him, in fact, he had a particularly colorless, commonplace appearance as he entered carrying a heavy brief case. Nevertheless, two of the smartly uniformed Criminology Corps men who stood about scanning the new arrivals watched him. They kept their eyes on him while he checked his baggage, and as he came up to the gate where he was to be electronically searched for weapons and contraband, they moved closer together, spoke a few words, and motioned to a man in civilian clothes who was standing just outside the gate. He nodded comprehendingly and when the little man left the gate, he followed him unobtrusively.

The uniformed men watched until they left the Customs. "Another slip-up at one," said one of them. "They must tell 'em the right answers first up there or something."

The other nodded, "Yeah, that's the second one in less than a month. D'ya suppose we should've picked him up?"

"No, he might be O.K.," the first one replied. "Or he might be a VIP. With Balik on him, we'll know where he is in case Tappan says pull him in."

Outside, the little man entered one of the little three-wheeled taxis. The plainclothes man moved quietly along the wall until he came to a tiny call box. Opening it and pressing a few buttons, he spoke a half-dozen words into it. The cab driver looked up as the other walked slowly past the stand and nodded almost imperceptibly. The plainclothes man entered a door a few paces down

the corridor. He went into a room which contained a number of telescreens with men in front of most of them. Going to one that was not occupied, he twirled the dials for a few seconds, and the face of his quarry swam into focus. They were just driving up to the elevators at the end of the corridor. His face disappeared and an elevator door came on for a second, showing a sign "Platinumrest Hotel" above it. There was a few seconds wait, and his face came into view again in the elevator. In the lobby of the hotel several levels above, the man at the screen watched him register and when he entered his room, he was in plain sigh of the viewer.

After watching him a bit longer, the man at the screen called one of the operators over, spoke a few words to him, and left the screen to him. Going into another room, he picked up a file out of an automatic filing machine, and read it closely.

A few minutes later he stood in front of a desk in a gleaming chromium and black office. The man behind the desk was groaning, as if he was in pain.

"Evidentally, Station One was asleep again. Though I'll be doggoned if I see how they missed this one. A perfect specimen if I ever saw one. Occupation: Diamond buyer. Name: Van der Bush. Address: Amsterdam. Not much else

on him, but we're checking with One," the first man said.

"Maybe we should have picked him up, but we've been a little cautious since we got that senator from South Africa last month. We can pull him in now, if you say so, sir."

The man behind the desk answered, "No, don't bother him unless you have to. Even if he's not a VIP, he'd probably make a squawk. Besides, it won't hurt morale to let 'em know we trust 'em a little. Good work, Balik, in spotting him."

Balik saluted and left. The other man got up and walked across the office, stopping to stare at a chart which covered one wall.

It was a detailed diagram of Moon Station Seven. To the ordinary observer, Station Seven was like all the other mining stations on the back side of the Moon. However, coming in through the Customs, one might note the large number of uniformed CC men, and to an experienced observer, there would also be apparent a large number of men in civilian clothes, whose penetrating eyes as they watched the throng would give them away as plainclothes Criminology Corpsmen. The rest of the crowd was much the same as one would find anywhere on the Moon, a scattering of spacemen, a few businessmen, many miners, and an occasional prospector.

There was a difference, however. The successful looking man who sat next to you in a restaurant at Seven, for instance. He might have been one of the most successful embezzlers in the business not too long ago, or the prospector in his battered moonsuit, with his pack of rock samples. He might be an ex-murderer. This was the famous Tappan Project. It was set up for the purpose of rehabilitating criminals, and the majority of the inhabitants of the Station were ex-criminals with an amazing variety of crimes to their credit.

It was Tappan's project from beginning to end, and he was responsible for making it work. It was based on the idea that instead of casting the criminal out from society, you could achieve the same results by simply eliminating from their environment the elements of society that caused them to commit crimes. Tappan knew that many criminals were ordinary individuals, except for a rebellious trait in their character which kept them from seeing the wrong in obeying the rules that governed the rest of society. If they were removed to some selected environment where there would be no rules for them to break, they could lead useful, ordinary lives.

As he stared at the map he thought about the long years spent in development of the idea and getting it accepted. He had drawn up his plans, spending years among criminals, in prisons and in the underworld, gathering facts. Then he had presented them to the lawmakers. He had explained that "reform" was practically meaningless to this type of criminal, since the same state of mind that kept them from seeing

their guilt in the first place would prevent them from reforming. The only thing that the old system did was make them try harder to keep from getting caught the next time.

Of course, he warned them, this would apply only to a certain type of criminal. There were others who could be reformed, and still others who were incapable of performing any useful tasks. They could be handled elsewhere.

He thought of the days spent in committee hearings, explaining his project. The lawmakers had been unable to see how such an experiment could be made to work, and all his facts and diagrams could not make them understand it.

Finally, however, the back of the Moon had been opened, and colonists who were willing to become permanent residents, in order to mine the rich mineral resources of the mountains of the Moon were hard to find, even for the high pay offered, so they had authorized the establishment of Station Seven. Tappan had scoured the prisons of the Atlantic Federation, selecting his subjects for stamina in order to stand the life on the Moon, as well as their potential ability to be useful. Then, along with a number of criminologists who had studied under him and understood his methods, and a few noncriminals, he had brought them here. They had arrived when there was nothing at Station Seven except a huge empty underground dome and a few quonset huts, and built a thriving mining town out of it. Tappan hoped eventually to be able to send a few back to civilization on business missions, and perhaps some day, allow a few to return permanently. But that was in the future. His immediate concern was to keep them safe from the undesirable elements of civilization which were always creeping in.

At first, when the group of noncriminals had been brought along to help set the station up, there had been some trouble with them, for undesirables had been included in spite of the careful selection. Since then, however, he had improved his system of selecting the individuals who were capable of getting along in a criminal society, and most of the noncriminals had gone anyhow, leaving only a select group of CC men, who kept the colony under a close but inconspicuous surveillance, moving rapidly to stamp out any crime-potential condition as soon as it became apparent to their trained eyes.

Although the experiment had succeeded beyond Tappan's wildest expectations, there was still an element on Earth and at Station One—which they were beginning to call Luna City—who were inalterably opposed to the project for various reasons. Tappan now returned to his desk and resumed his reading of an article written for them—by a "Luna City" correspondent who had been refused a permit to visit the Station. As Tappan read the article he did a bit of quick psychoanalysis on the writer, and it was apparent why he

had been refused entrance. However, in spite of the fact that he had never seen the place the correspondent painted an unpleasing picture of what he called, "Tappan's slave-labor camp," and accused the guards of incredible brutalities. As he read this his jaw tightened. Actually the men, who hated to be called "guards" in the first place, were skillful criminologists who were as incapable of brutalities as any group of men alive. Most of them even refused to carry any sort of weapon.

However, as he read on, some of his ire changed to amusement. The writer seemed confused. In almost the same paragraph he described an ex-gambler who was becoming very wealthy as a mineral broker in the local mineral exchange. He described him in detail, brought up the fact that he had been one of the most successful gamblers in the business a few years previously. Tappan reminded himself to show the article to the gentleman in question, for the writer seemed alarmed at the idea of an ex-gambler being a broker. He was applying his talents at figuring odds quite successfully to the business of anticipating the price of uranium and gold now, and Tappan considered him one of his most promising subjects.

As he considered this, a disturbing thought struck him, and he turned off the microfilm viewer and entered another room, where there was a large telescreen. He switched it on and ordered into the mike beside it: "Put our little friend Van der Bush on, Jones. I'd like to see where he is now."

The screen glowed, and forms began to take shape. He could see the floor of the mineral exchange. An arrow of light pointed toward the booth in the center of the floor. "There he is, sir, over by Corrigan's booth. He's been buying diamonds."

Corrigan was the gambler mentioned in the article. Tappan watched the little man for a bit, speculatively. Then he said, "Thanks, Jones. Just keep a close eye on him." Then flipped the set off.

He returned to his desk and pressed a button summoning his secretary. She entered, a long-legged blond girl, with humorous intelligent blue eyes. She stood by the side of his desk, waiting to see what he wanted.

Tappan leaned back in his chair. "Shelia," he said, "what about having dinner and things with me at the Platinumrest tonight? We need a little relaxation."

Her eyes appraised him calmly. "Relaxation, Boss? Or some sort of business?" She had gone out with Tappan on several occasions, and his social life seemed to consist of nothing more than another method of keeping check on his criminals.

Tappan chuckled, "Well . . . a little, perhaps. Mostly, though, just the pleasure of your company."

She replied, "All right, Chief. But I'd like to see you forget your job once in a while."

That night, Shelia and Tappan sat

at a table in the above-ground cocktail lounge of the Platinumrest. The plexiglass dome that covered them had recently been shined, removing all traces of meteor scars, and the stars shone through beautifully.

Tappan was telling one of his innumerable fund of stories about his experiences in the underworld while they sipped their drinks, and although he was careful to tell it objectively, Shelia thought she could detect traces of his being the hero of the incident. She was fairly new at Station Seven, having been at One for a year when job at Seven was opened. She had accepted, for the salary was even better than the average on the Moon. When she discovered that she was to be private secretary to the great Tappan, she did not know whether to be happy at the chance, or to quit. However, she discovered that, in addition to being a pleasant employer, he was a very handsome man, and seemed to show some interest in her. It was annoying at times, though, to work for him. She never knew whether he was laughing at her or not, and she was certain that, just as he seemed to know what his criminals were thinking, he could read her mind to a certain extent. It was embarrassing.

Two men entered the room. One of them she knew. It was Corrigan the mineral exchange man, but the other one she had never seen around Station Seven before. They seemed unable to find a table, and Tappan, after glancing inquiringly at her and waiting until she smiled assent, motioned them over.

Corrigan introduced his companion as Mr. Van der Bush, a diamond buyer. Van der Bush bowed formally and said, with a faint accent, "Verry pleased to meet you."

Tappan began telling Corrigan about the magazine article which had been alarmed about him, and they laughed merrily at the incongruity of it. Van der Bush said, "Yes, Mr. Corrigan has been telling me about the wonderful job you haff been doing here, Mr. Tappan. How you haff reformed him ant the others and made useful citizens again of them."

Tappan winced slightly at the mention of the word, reform. Shelia knew it was one of his pet hates, and expected him to say something, but he refrained, glancing hard at Corrigan.

They talked of the project. Corrigan told them some of the facts behind the constantly changing prices of minerals on the Moon. Hearing him as he gave information about his business, one would have put him down as a man who had grown up in the brokerage business, probably serving an apprenticeship in New York on the Stock Exchange, or some other place of the sort on the Earth, instead of over a green tabletop.

The music started. Shelia looked as if she wished to dance. Tappan smiled at her and said, "You know I'm not a very good dancer. Perhaps Mr. Van der Bush—" He was

lying, she knew, but she realized that he had something to say to Corrigan so, when the little diamond buyer rose from the table, bowing, she went with him to the dance floor.

The two men watched the tall girl and the little man as they danced. There was a great deal of resemblance between the criminologist and the ex-gambler. Both of them were near the same age, and they were both well-built physical specimens. In addition, they habitually wore an expression of amused tolerance about their faces. Seeing them together would have made one believe that they might be engaged in the same profession.

Tappan said casually: "Strange little character, Van der Bush, isn't he?"

The ex-gambler glanced sharply at the criminologist. "I really hadn't noticed anything unusual about him. Seems pretty commonplace to me."

Tappan continued to watch the dancers. "As a matter of fact," he went on, "I suspect that he's unique among the population of Station Seven. I think he'd be interesting to watch, since he's a little out of the ordinary, don't you?"

Corrigan laughed, "Since you mention it, he might be at that. But I don't imagine he'll be around long enough for us to really get to know him. What do you think?"

Tappan's "Perhaps" was noncommittal. The dancers rejoined them, and shortly afterwards, the two men left.

Shelia looked inquiringly at Tappan. "I don't get it, Chief. What went on that I missed?"

Tappan chuckled. "Business is over. That's what you wanted, wasn't it?"

He dodged the subject the rest of the evening, and when he finally said good night at the door of her apartment, the girl was still in the dark about the whole business.

Next morning, as Tappan was finishing a leisurely breakfast in the administrative office's restaurant, Van der Bush entered and sat down at the counter beside him. "Ah, good morning, Mr. Tappan. Business brings me here, but I haff not had my coffee. Would you be so kind as to join me in a cup?"

Tappan nodded and motioned to the counterman. The little man went on. "I haff decided to go prospecting, Mr. Tappan. I am not a geologist, but I haff some knowledge of the business, and an excellent vein of diamond bearing clay hass been discovered just beyond the spaceship landing ramps, I am told this morning. I will seek a permit to go out and examine it."

Tappan turned to face him. "Very interesting, Mr. Van der Bush. I had not heard of it. Of course," he smiled, "Mr. Corrigan would know of it before any of us up here, I'm sure."

Van der Bush chuckled gleefully, "Oh, no, Mr. Tappan. Efen Mr. Corrigan does not know yet of this one. I haff contacted the prospector who discovered it. I haff not seen

Mr. Corrigan since we left you last night."

He chatted on, telling Tappan of the prospector who had called on him this morning, and how he had needed a little money to finance the claim until it began to produce. Tappan listened with an air of semi-detachment, letting his fingers wander over a small jukeboxlike device in front of him.

They finished their coffee and Tappan bade the little diamond buyer good-by. Van der Bush said: "I am going to come up and see you one of these days, Mr. Tappan. I expecde to pe here for some time."

Tappan hurried to his office. Shelia was just putting some mail on his desk when he entered. She looked up and said cheerfully: "Good morning, Boss. I—"

He interrupted her with, "Quick, get the permit office. Tell 'em Van der whosis is coming over to get a prospector's permit. I want him stalled until they can give him the tests. Tell 'em that they can tell him that they give them to everybody who applies for one, or anything."

She moved instantly to obey. Tappan dialed Balik, and when the plainclothes man's face appeared on the telescreen, he said: "Go by and pick up the latest on Van der Bush and head for the permit office. I want you to get him out as soon as they finish quizzing him. No excitement. If you work fast, he won't know what's happened. Ask him about the prospector, too. Might be interesting to meet him."

Balik grinned, "I was watching you when it happened. Good work, Chief. And I know who the 'prospector' was, too. Want to talk to him?"

"No. It won't be necessary. It wasn't his fault. We should've picked the diamond man up sooner."

"Roger. Don't worry about him, Chief. He won't know what happened 'til he's landing at Luna City." Balik replied confidently, signing off.

Shutting the set off, Tappan leaned back in his chair. His secretary entered saying, "They said they had him, Chief. He was already there when I called." Her face wore a puzzled frown. "But I don't understand why you want to kick him out. He was a nice little guy, really. How come?"

Tappan chuckled. "I suppose you should know what happened, since you helped a bit. Sit down and I'll try to explain." She complied, and Tappan rose from his chair and seated himself on the corner of the desk. "You see," he began, "that's just the reason we don't want him around—because he's such a harmless little chap. Probably never did anyone any harm in his life—consciously. That made him an extremely dangerous type around here, however. He could have caused more damage than an exploding meteor. You see, just as ordinary society considers the criminal dangerous, here we consider harmless little characters like Van der Bush dangerous because of the harm he can cause criminals to do

him. These people aren't going to commit any crimes as long as there's no opportunity, but when the temptation is too great, they just can't help it. And Van der Bush is a one-hundred percent, gold-plated fall guy. In other words, he is one of the finest specimens of an old-fashioned sucker I've seen in many a day. To have turned him loose here would have been like putting a nice little lamb in a cage of hungry lions and expecting them not to eat it!"

Shelia laughed. "I see now. You just didn't want the populace endangered. But why didn't you pick him up as soon as he got here? Looks to me as if that would've been better."

Tappan's face became solemn. "I wish we could have, Shelia. But Station Seven has a lot of enemies. They are watching all the time for something to hang on us. If we had turned him back, they would have said, 'Slave labor camp! He doesn't want anyone to see what he's doing' —or something of the sort."

He got up and walked around the desk, "It's hard to convince people of a simple thing like this. The old idea of punishing the criminal, making him pay his debt to society, has been around a long time. They like to talk about society being to blame for crime, but they mean society in the 'abstract'. When we come along and point out individuals, and say, 'You are one of the causative factors of crime,' they won't let themselves face the fact. They want to tear us down, make us take it back, and let them go on talking about society in the abstract. One crime committed here wouldn't mean that the project had failed, but it would mean the end of us if it got out."

"You saw part of what could have happened if we'd let Van der Bush alone. Corrigan is safer than the average, because he figures the odds against getting away with it. But this looked so easy, and safe, that he just couldn't resist trying to sell him a bill of goods. As soon as he found out we were keeping our eye on Van der Bush, however, he didn't look so attractive."

"But the situation still existed. After he left us, somebody sold him the old diamond deposit fraud, and he fell for it like a ton of uranium. If he had been around a week, we'd have had a crime wave, with him as the sole victim of all of 'em."

He smiled and sat down again. "But he didn't, thanks to Balik and the others being alert. Let's forget about him now. How about a repeat on that date again tonight? And this time absolutely no business. I promise."

Shelia rose to leave the office. "Suits me, Boss. But if you think you're going to get by without telling me more about this business, you're nuts. I still want to know—"

Tappan interrupted her by saying in a mock-stern voice, "Please, we must get to work. You're loafing on the Station's time, Miss!"

THE END

NOT TO BE OPENED—

BY ROGER FLINT YOUNG

One thing about machines, there's an inevitable logic about them, and their organization. If a man could really follow that logic through—some deadly little bits of knowledge might turn up . . .

Illustrated by Ward

When Jim Tredel was a boy he was towheaded and already large framed. People said he would grow up to be big, like his father, and blond, and probably not bad looking. He did grow big, like his father, and not bad looking. Not good looking, just not bad looking. He fooled them on the blond business, he kept on looking like a towhead.

When Jim Tredel was six years old there had been a game, a quite wonderful, only partly understood, game which his father began to play with him. In later years Jim ran across the quotation, "Underlying oneness—" that seemed to help express all his father tried to teach him in that game.

Big Tom Tredel was a machinist. He worked in a machine shop when he was ten years old. He worked there all his life, the last forty-five years as its owner. He was in the same shop when he was past seventy. With no schooling at all he learned to read and write while he worked. He learned all the math and common sense he ever had reason to need, at the shop or away from it.

On his own, he learned a philosophy that was his own. It began to form in the first few weeks he worked, grew with the years.

"There is no such thing as a *part,*" he would explain, over and over, to his son, Jim. It was Jim Tredel, not James, just as the father was Tom, not Thomas—a full and legal name.

"There is no such thing as a *piece.* There is no such thing as something that doesn't belong to something else. There is nothing, except as it fits into something else, as it's part of the whole.

"The arm of a chair now, for instance. That arm is meant to fit the back of a chair, and the seat of the chair. It is also meant to fit the forearm of the man who sits in it. A person who's never seen one before, but is trained to know relationships, should be able to reason

out what that chair arm is, and what a chair looks like.

"The arm goes with other parts to make a chair. But that chair isn't complete in itself. It's designed to hold a man who sits. It's no good unless it does that. The four legs of the chair are made to come to the same plane, so it will rest evenly on the floor. And the floor is another component, meeting the walls of the house, which are built to reach the foundations.

"The foundations lead to the street, and that street connects with other streets, so that one house is connected to all the other houses in the world. And if there's an ocean in between, they're still connected."

Tom Tredel had a hundred different ways of saying the same thing, so that the boy must understand. And, with it all, they played the game.

For a while it had been jigsaw puzzles, and the boy had seen the interconnection of the pieces, and how each piece fitted others, and yet others.

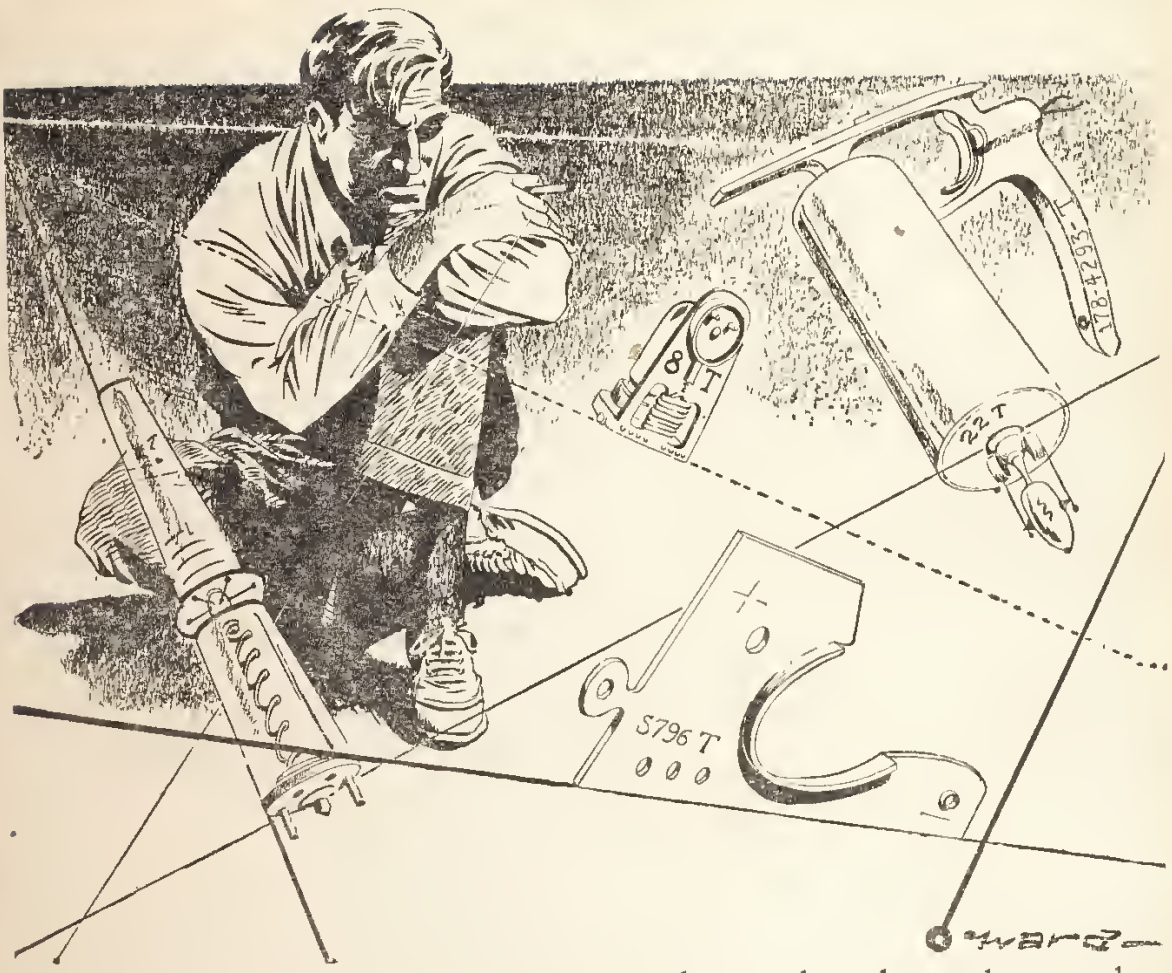
Then he had the same building toys to play with that other children had, but he learned to play with them a little differently. It was not what could be constructed with them that mattered, it was the way the units went together that was important. Then the realization that the whole was not really the whole, because it had become a part of the table, the floor, or whatever it rested upon, and thus was attached to the Earth, the Moon, the Sun, and the Universe.

Tom Tredel could take a machined-part in his big, rough hands, or a piece of sheet metal that had been fashioned with a purpose, study it briefly, turning it to observe unseen attachments, and seem to see the continuations of it that were not there to be seen. From a part he could visualize the assembly of which it must be component, and then describe the connecting assemblies until he had joined it finally and without question to Earth. Only then was he satisfied, and only then did it become an orderly component of an orderly Universe.

Jim learned. At first it was a game, and fun. Later on, it was not a game, and not so much fun. Yet, he continued to learn, because at the same time he discovered it was not, actually, a game, he was old enough to know it was expected of him. Tom Tredel saw that his son did what was expected of him.

Still, it was not the trade of machinist that Tom Tredel wanted Jim to learn. Jim picked it up, the way he was taught—working in the shop to earn allowance money.

His father had other plans for Jim. Something just a little bit better than being a machinist had come along, and Tom was quick to see it. Some people might think a lot of things better than being a machinist—being a doctor, lawyer, dentist. To Tom Tredel those were the occupations that carried men along, so they



could do the work men ought to be doing. The important man was one who made things by which the world moved, and advanced. A machinist, now—

What he saw for Jim was electronics. At the time it was radio, but Tom Tredel saw how electronics would mean other things than radio. Noncommunications electronics and radio would some day be the field his descendants should be in. Perhaps the big opportunities wouldn't come in Jim's lifetime, but Jim could raise *his* boy in that field, too. He could pass on just a little more knowledge than a boy would get who was born to be a doctor, lawyer, dentist, or machinist.

Jim would get the education he needed for electronics, and all the help money and planning could provide. He'd also understand the philosophy of Tom Tredel, and he'd know something of the relationships of parts to the whole.

Jim showed the proper interest in electronics. He was led cleverly, yet wisely, along the path that would make him choose it as his life's work.

He had been an apt pupil. He could take a part, in fingers that were longer, hands that were as strong, yet softer, than his father's had been, and visualize its place in the all.

Because of his father's choice of electronics, he had the opportunity to step onto a road—

The three-year chase was over. The trap was sprung.

In the darkness, dark as he had never before known it, Jim Tredel managed a grin, now that his fear was gone. That blinding, instinctive fear had been replaced, slowly, by the certainty of death, close at hand. Fear could no longer be used as a stimulus that might aid escape, and had given way to resignation.

It had been fear, though. Or more —shocking, numbing terror. Then he realized that for three years his mind had been preparing him, slowly, for a climax that must terrify him. Hardly any move he had made, hardly any discovery that had come to him in those three years, but now seemed almost designed to prepare him to be afraid, when at last there should be something to fear.

Why bother, now, to decide his mistake? The immediate error, of course, had been stepping into the hall. It had looked like all the others he'd traversed so carefully, moving slowly, ever alert for an alarm system. It was ten feet wide, ten feet high, like the others, and appeared to be about a hundred feet long.

Jim Tredel had stepped into it, cautiously, going forward slowly. He was three steps on his way when the darkness came, suddenly, without sound.

At first he thought the lights were gone. Then he realized that, behind him, where the opening had been, was now a wall. In front of him, where the passage seemed so clear, there was another wall. That was when he knew the fear, when he realized the trap was sprung, and he was in it.

He lit a match, after a few minutes, when he was sure his hand was steady. Ten feet wide, and ten feet high, this hall had been. Now its length was also ten feet. Each of the six sides was of metal, smooth, polished, with neither break nor opening, with no glint of light from outside, nor breath of air. Lightproof, air-tight, and, if it mattered, probably soundproofed as well.

Even in a melodrama it would have been perfect. From this time on, anything could happen. A wall could advance to squeeze the life from him. Water could be let in to drown him. Heat or cold could be used to—

Whatever the method, one of those, dozen of others, his lack of future could be assured by his captors without ever letting him out of the trap, until they were sure he would be no further trouble to them. They would not even hear his screams. He was quite certain he would scream, protesting the removal of a life he had come to enjoy.

They would take that life, surely. That had been plain from the start. Almost three years before, he had known that, if he ever slipped— And he had slipped, badly.

Perhaps it had been merely walk-

ing into the hall. Perhaps it was coming here at all. Or coming alone. Or—

It didn't matter. It was much too late to consider what he should have done. Still, he should have let someone know, left some word that would guide others. Instead, his three years of work would be wasted, even as his life would be.

He could feel calm about it, then. He had bet his life, and lost.

Tredel had been out of the army six weeks, married to Edith for five of them, when he went back to the plant. It looked good to see that sign, over the new buildings: Tredel & Morton, Electronics.

And to see Morton again. Bruce Morton, middle-aged, balding, always serious, always nervous, always grateful to Jim Tredel for taking him in as partner when the company started. It was Morton who kept the business going, expanding it tremendously, while Tredel was in the army.

Morton showed him through the new plant, briefly, and then displayed the current line of products.

There was the fourteen tube hi-fidelity amplifier, the portable PA system, the new motor control, the intercom unit, the phonodoor, the—

That was what caught Tredel's attention. He picked up the small metal stamping, turning it over in his hand, curiously.

Morton bobbed his head at it, hurried to explain. "You know, Jim, during the war we got a lot of new machinery. Used some of it to do subcontract work. When it wasn't tied up with our own production, that is.

"We've been keeping on, to some extent. We don't have enough work of our own to keep the machines busy. This way we can keep the man power employed. There's money in it, too."

Tredel continued to stare at the stamping. His mind was working as it always did, always must, with detail parts, the way his father had taught him. He tried to visualize the assembly, not liking what he saw. Not liking it at all. Not understanding, thoroughly, but knowing he did not like it. There was menace, there, and something—some strangeness.

"What's it for?" He tried to ask it casually.

"Some toy manufacturer . . . Triesting Company."

"Guess they converted over to war, too?"

"No . . . or, yes, they did. Not armaments, though. They dropped toys to make some sort of special heating equipment for the Navy. Now they're back to toys exclusive."

Tredel hesitated. Then: "This is part of a toy?"

Morton bobbed his head. "Sure. That's all they make—toys. Now, here's our new television tuner—"

Tredel replaced the stamping reluctantly and followed Morton. His mind was still on Triesting. "Toys. Exclusive."

Yet, that stamping was part of no toy. Not the kind of toys children

played with, anyhow. The kind grown-ups used when they wanted to kill other grown-ups. Not the kind of weapon he'd ever seen, or heard of. But, somehow, the assembly he visualized wasn't designed by any kind of grown-ups he'd ever heard of, either.

He and Edith would be having children, some day, and—

From the time he picked up that stamping until he found himself in a ten-foot room was just a little over three years.

Edith left him at the end of the first year.

Not just like that. Not just like that at all. She didn't get up one day, surprised him, said she'd had enough and later walked out.

There had been almost a year of things she had to take. Of disappearances on his part, of unexplained trips, of secrecies she couldn't understand. There were long periods, when he was at home, of moodiness and thought, and inattention to her. She really had been forced to imagine almost everything, at one time or another, and he never had an excuse to offer, just asking her to trust him.

She had trusted him. Trusted him more than she should have, much longer than he had a right to expect. Then— Well, she had been right, it was just no life for a married woman. If he ever— Well, she gave him enough hope. If it hadn't become such an obsession with him, he could have stopped his pursuit any time in the next two years, gone to her and asked to start over. He would never have had to explain the past. But he hadn't been able to stop.

From the very first he had somehow sensed that there would be no evidence. That is, nothing concrete he could seize upon to give him an immediate, clear-cut answer. Even then he had known he was working with intangibles. He would have to lean heavily upon half-seen suspicions, upon intuitions that were only vague feelings. That would be all he would have to go on. Another man would have had less.

Triesting *did* manufacture toys. Nothing but toys. A certain number of people reported for work each day, put in a certain number of hours, and returned the next day for more. As a result, there was a certain flow of finished toys from the factory.

The first real blow came when he found one of their toys used the stamping which he held in question.

He almost gave up, then. Did give up, telling himself he was strictly a fool. He went back to his own business, to living his own life.

Yet, it kept nagging at his mind. Time after time he tried to put the thoughts away. One should never be a fool more than once over the same subject.

Then he went out and bought one of their Mystery Ray Pistols. He took it apart, studied it, redesigned it to his own satisfaction. He made

parts for his redesign, assembled them, and tried the toy.

It worked just a little better than the product Triesting was making. Worked better and would be cheaper to produce. And it didn't make use of the stamping made by Tredel & Morton.

In fact, it was what Triesting Company would have designed and manufactured unless they were determined to make use of that stamping, whether it added expense or not.

Which didn't make sense.

He took it easy. Think it over for a while, be sure. His mind worked on it, always came up with the same answer.

"Bruce!"

Morton looked up.

"That stamping we're making for Triesting—"

Morton nodded.

"Do we ever get rejections?"

Morton looked surprised. "Funny you should bring that up, Jim. Matter of fact, when we . . . I, that is . . . signed the contract, it called for very rigid specifications.

"We magnarayed the first batch, as a matter of routine, and found that fifty percent of the parts wouldn't meet spec. Since they were only for toys, I had them delivered anyhow. I wasn't trying to pull anything. But I didn't want to take a loss on the parts. I thought I'd see how their receiving department inspection compared to our own inspection."

He paused. Then: "There was no squawk on the first batch. I figured their requirements weren't so stiff as they made out to begin with. Very often they aren't, of course, when there's no stress involved. Since then we've been shipping them full production, and they've been accepting and paying."

"Hm-m-m. Are we still inspecting?"

"Sure. Under the circumstances we haven't made any effort to better the product. The records show that about fifty percent still wouldn't meet their original spec."

That didn't mean much one way or another, Tredel realized. Lots of little companies, since the war, were still specifying quality that had gone with war contracts. It didn't mean anything in a lot of instances, except that it gave them a convenient way to break a contract if they wanted to.

Still, it stayed in his mind.

Two weeks later he went to San Francisco on business. There wasn't too much hurry, so he went by car, taking Edith with him, so that it was, in part, a pleasure trip. It would do her good, after the neglect he had been showing her.

He managed to squeeze yet another purpose out of it. Across the country, in towns picked at random, at toy stores selected thoroughly by chance, he bought Mystery Ray Pistols.

When they returned he had sixty-eight of the toy pistols. He disassembled them, removed the stamp-

ings and took them down to the plant.

The purple dye code on them was first. He checked against the book and found sixty-eight stampings were from sixteen different lots to leave Tredel & Morton.

Then he had them magnarayed. Sixty-eight of them failed to meet specifications.

It meant, with very little shadow of doubt, that the receiving department at Triesting Company was making the inspections. Only rejected parts were going into Mystery Ray Pistols.

The stampings that met spec? Where were they going?

Tredel considered getting into the toy factory to find out. Then thought made it seem that would not be the best way. Working in a factory, in some small section of it, he would have less opportunity to discover many things than would someone on the outside.

Perhaps what happened to the stampings inside the plant wasn't too important. It was where they went from there that mattered. Who did their shipping?

It took a week to check, make sure. All of their out-going freight was handled by Higgenson Rapid Transit, a well known trucking firm.

It took a month to trace down, to come to the conclusion that if anything were to be learned it would be something not obvious. All the shipments from Triesting went to the dock at Higgenson to be routed according to destination. So far as it was possible to check, without arousing suspicion, all shipments were aboveboard. They went to toy stores, to jobbers and distributors throughout the country, to factories in England, to representatives around the world.

I've spent, in cash outlay, about a thousand dollars, Tredel thought, summing it up, *and I've yet to eliminate a negative. It's not that I've got to find something positive, but—*

He saw it, then, as having the makings of a really long-range project. To come, eventually, close to the positive, he must eliminate the things that couldn't be.

So far, he had eliminated nothing. It wasn't a question of starting over. It was more that he went back to the beginning and chose a parallel line to check.

Tredel & Morton made a stamping that was in question. Who made the other parts of the assembly that he had visualized?

He built up the assembly, carefully, on paper, deciding how it *must* look in order to use the stamping. He did it again and again, checking his reasoning carefully, as though Big Tom Tredel were looking over his shoulder.

No. That was the way it had to be. *Had* to be.

He chose, finally, a part that would be the most unusual in shape. That would be the one to work on.

Then he thought about that part. Just thought about it for days. He guessed, discarded, guessed again. And discarded.

There would be few legitimate uses for such a part. An airplane perhaps. But the normal use of the part didn't have to be legitimate. As the stamping had turned up in a child's toy, the connecting part could turn up anywhere. An airplane? Throughout the country the number of plane parts used by manufacturers in current production, the number carried as spares for older models, would run into the millions. Impossible to trace down such usage—in a pin-ball machine perhaps; or a lock on a trunk; or even in another toy.

There was always the chance that such a part did not even exist. He could be wrong, wildly wrong. Even if he were right, in theory, the part might not be quite as he imagined it. While he might see it as it *had* to be, someone else might not have designed quite so logically. The Mystery Ray Pistol, for instance.

No, that didn't follow. The Mystery Ray Pistol was definitely a distortion. Someone had gone out of his way to design and make use of a part that had no business in the assembly.

Then he found the part, in his own plant, where it should never have been.

And, it was just as he had visualized it, just as he had sketched it. Just as he knew it must be. It was in production, on subcontract, under his very nose.

It was strictly an accident, his finding it, Morton had picked up a rivet-making machine, at a bargain price, and they were making their own rivets. They still used rivets and bolts where other companies used spotwelding. It gave the repair man a better chance to make repairs the way they should be made.

Tredel had gone out to the little shed where the machine was installed. The operator was in the corner, reading, when he entered. The man looked up, grinned a little sheepishly, then waved his hand at the machinery. He didn't try to talk. The rivet maker was going, with its loud, rapid *phut-ti-phut-phut-ti-phut* as it took the long wire from the drum, punched it into rivets, then ejected them into a stock cart. Tredel understood the gesture of the operator: "Takes care of itself, Boss. I just put on the wire and take away the rivets."

Well, that was all right. The place was clean and neat, rivets were being made, so there was nothing to complain about. Besides, the operator was reading a correspondence course in electronics. That was all right.

Tredel found the part in the trash barrel, bent a little out of shape. He picked it out quickly. There was no possibility of error. This was what he was looking for. Excited, eager, realizing his heart was pumping to the *phut-ti-phut* of the rivet maker, he signaled the operator to follow him out of the shed. In the quiet of the open air he held out the part.

"Yes sir?"

"I was wondering—do we make this?"

The operator glanced briefly at the part, then back at Tredel.

"Not any more. Used to. We had a punch press in here before the rivet maker. That part's a dilly. Took five operations just in the punch press."

"Not any more, though?"

"No sir. Maybe. I'm not sure. They took the punch press over to Building 7. I think all the parts like that were finished three months ago. Had that one on my desk as a paper weight. Tossed it out this morning."

They were still making the parts in Building 7, on a lot basis. They made one thousand of them on the first working day of each month.

"We've got it down good, Mr. Tredel," the aproned punch press operator told him, "but still they keep coming up the first of every month. I'd like to go ahead and make them all up sometime. Then they could deliver to the contractor when he calls for them. Save a lot of set-up time." The operator hesitated, feeling as though he had talked of things that were not his to talk about. "Course, I know how it is: Contract cancellation comes along, and we'd be stuck with a bunch of them. Still, I get sick of them. First job every month."

Tredel nodded as though he'd been listening, headed back to his office, part in his pocket.

Even in his own organization it took him three days to discover what the part was, and who ordered it. He realized then, concretely, the difficulty he would have working in some other company trying to discover something.

Of course, he could have asked. Morton would have known right away. Tredel felt the time was still there to be cautious.

The way he had to find out made it slow. Show an interest in what the company was making for other people. Then get into the order and blueprint files without seeming overanxious.

He went three-quarters of the way through the files before he found what he wanted. At that, he almost missed it.

The order was in an envelope, with a glassine front, and the blueprint was tucked inside the envelope. From the description on the order he didn't recognize the part: End-Record Rack Size AB.

No, that couldn't be it. He went four envelopes further, then went back to the blueprint for the record rack end and pulled it out. That was it.

It was a detail print, but in the upper left-hand corner there was a small drawing of the assembly, showing the way the end fitted. Not the best design for the end, by a long shot, and it called for the use of a connecting detail that could have been eliminated, but logical enough.

Structurally the end was rather meaningless, but the peculiar curve

of it extended through the record rack, so that in the assembly it became integral. The end seemed designed to carry out the curve of the rack. Someone would have to be twisting his thoughts the way Tredel was shaping his to imagine that the record rack might have been designed to agree with the end.

Tredel checked the spec. Nothing bad here. It called for tolerances that were a cinch to meet, though they were exacting. Once the tools were made accurately, they couldn't miss. Hardness specified was natural for the grade of aluminum used. Holes were to be located and drilled on assembly. No finish.

Then he was guessing again. Production of Priesting stampings were five hundred a month. Approximately half were used in Mystery Ray Pistols, leaving two hundred and fifty unaccounted for. Therefore, two hundred and fifty of the record rack ends should be unaccounted for, leaving seven hundred and fifty to go into record racks.

Providing there were such record racks, and he rather imagined—

There were, all right. Tosdal Specialties made record racks and book ends and ash trays and other low-cost home furnishing extras. They had a small shop, employed seven people including the owner, and had two salesmen on the road working on commission. It took two weeks of maneuvering to determine that each month they manufactured seven hundred and fifty record racks.

Their deliveries were all made through Higgenson Rapid Transit.

He had a few things to stop and think about. Assuming: Someone was acquiring parts for an assembly, and didn't want it known, then there were certain things they should do.

Some of those things were being taken care of very well. That was the use of the components for normal purposes. Strained usages, perhaps, but under most circumstances good enough so as to arouse no suspicions. The use of one trucking company was not, possibly, a mistake, since it was a popular trucking line and most of its business was probably legitimate. It did not seem a mistake to have more than one component of such an assembly manufactured by one company. Of course, it should be good enough. Had been good enough until Tredel chanced on it. Still—

He investigated a little further, carefully, and now through Morton. All it seemed to be was routine curiosity about their cutsomers.

"We inherited Tosdal Specialties," Morton explained. "They were having their work done by Marcus Sheet Metal. We took Marcus over, lock stock and barrel. They got into a few things out of their line, and got in too deep. It was a good chance to pick up equipment and business, so I bought them out.

"We took over most of their accounts, too. Tosdal didn't care, so long as he got the same work at the

same price. Most of Marcus' other customers felt the same way."

That was better. It was an accident, then, that more than one component was in the same plant. An accident that couldn't be very well foreseen. Faced with the necessity of getting a new subcontractor, or—

That implied direct knowledge. On whose part? Did Tosdal know? Did Triesting? If each handled only one component, there were seven components to the assembly— That meant perhaps a maximum of seven different companies similar to Tosdal and Triesting doing the cover-up—for one assembly.

One town. Temple City. Two Companies. Triesting. Tosdal. Temple. Triesting. Tosdal. T T T. That couldn't mean anything, of course.

Could it?

Suppose he took the telephone book and found five more companies beginning with the letter *T?*

He went through the classified book three times before he had what he wanted. It took a month, working at home and at the office. His list had to be made carefully. Better to include too many than exclude one. If he had been doing such a list earlier, he would have left out a specialties company. What he wanted was anyone registered as a possibility to do assembly work. Leave out fabrications for the moment. Risky, but leave them out for the moment, and assume the pattern would carry through.

He was left with the names of seventy-three companies beginning with the letter *T*.

Now what? It seemed obvious.

There were several ways. Direct observation. Employment of an agency. Cautious telephone calls. A phony questionnaire.

No, he wasn't ready to go to an agency. Too much danger of a leak. Too much chance of a leak on telephone calls, or questionnaire. Only surely secret way was the long way—observation.

He marked a city map carefully, to show the location of all the companies on his list, then he started driving.

He had to assume exclusive use, such as employed by Tosdal and Triesting. It wasn't certain, but possible.

By the end of the week, by driving and looking, he cut the list down to twenty-seven. In two days more there were only eleven left on the list. He knocked seven more off in the two days of closer observation.

Which left four companies starting with *T* who used Higgenson Rapid Transit. Others he had seen using Higgenson, but all the others had at least one other truck from a rival company taking out deliveries. These four were the exclusives.

Thornton Manufacturing. Temple City Products. Top-Notch Corporation. Thompson Electric. Four where there should have been five.

It wasn't hard to get hold of catalogues and bulletins from the firms. He hesitated to approach them directly, and finally did his shopping through retail outlets. In a week he had four more parts to his assembly. And each one was as he had known it must be.

There was still one part missing. He could make it himself, he knew, but Tredel preferred to find out where it came from, to have a part that was actually made to go on the assembly.

Back to the classified index, back to his driving. And three weeks later he still had only the six parts.

In the fourth week he found the seventh part. Under his own nose again. In his own factory. In an intercommunication unit he had designed himself.

Only it wasn't quite the way he had designed it, before the war. There were several changes. Basically it was the same unit, but the changes had been made to conform and allow the use of a new part.

Morton! Tredel had to think, then. Really think. That wasn't possible. Or was it? How much did he know about the man, really? Outside of the fact that they'd been friends for a long time, now, and Morton had proven himself trustworthy enough—or had he? How much did you ever know, really, about a friend, or anyone besides yourself? Even yourself?

He couldn't go to Morton. No, he couldn't go to Morton whether the man was innocent or guilty.

Still, he found out what he wanted to know.

They'd had a large order for intercom units during the war. The customer had the required priority to make materials and assembly time available. He'd insisted on a couple of changes, which had been made. It called for several new parts, which, since they didn't have the facilities, they'd subcontracted to Young Brothers. They'd switched the whole design, then, thinking it simpler to make all the intercoms the same, and there was little cost difference.

The customer was still on the books, still taking intercoms and spares. Tredel wasn't surprised to find that the spares on his suspect

part amounted to two-hundred-and-fifty a month.

It seemed ridiculous at first. A customer ordered fifty intercoms a month, and two-hundred-and-fifty spares on a part that was under no strain, had practically no chance of breaking, no need to be replaced. How could he expect to go unsuspected?

Yet, why not? Who was there to question it? Certainly Morton never had. Almost every company gets enough screwy orders so that sooner or later they stop worrying about what the customer is going to do. As long as they order and pay, that's enough.

Still, this was one he could trace down. Wilson Watkins Company, Los Angeles. The *T* didn't follow there. It was only then that he realized—Tredel & Morton. Their intercoms had been picked because their company name started with *T*.

It was something more of a shock, to remember, seconds later, that all their outgoing freight was handled by Higgenson. Morton said they offered special rates, so—

In Los Angeles, Tredel found the Wilson Watkins Company listed, in the classified book, as manufacturers of intercommunication and sound equipment. Manufacturers.

He tried a few radio stores first, found his intercoms on sale. There had been a slight change in them. Now the Tredel & Morton nameplate was gone, replaced by a new one: Wilson Watkins.

He went to them directly, then, and talked to Watkins. Watkins was big, bluff, red-faced and bald. He used tissues to wipe continuously at a steady stream of sweat-moisture from his face. He coughed, agonizingly, when Tredel lighted a cigarette, and looked grateful when it was immediately put out.

"Sure, we take your intercoms, change the nameplate, and sell them out here. We've never had quite the market to go into the manufacturing ourselves. We want to carry them, so we use yours. We don't like to turn down orders for them, you see, because it might mean business for items we do manufacture."

Tredel nodded. "That's understandable. I was wondering how you happened to start ordering from us. We never do much business out here, you know."

"I know. You've got a mighty good name, though. Best there is in your line. We don't try to match it, of course. I mean our stuff is all right, but not high quality like yours. Just general utility.

"Well, during the war we got an order for intercoms. We couldn't handle it and told the customer that. We hated to turn them down, because we were doing a lot of their work, and wanted to keep them happy. They needed the intercoms for a Navy job, and could get all the priorities. Well, they said they wanted to get them locally, someone who could give them help if they ran into trouble, and—"

Watkins hesitated abruptly,

flushed deeper, and mopped at his wet face, gasping a little for breath.

"Some kick-back arrangement?" Tredel suggested.

Watkins grinned uncomfortably. "We had some discounting arrangements worked out, you understand. Not kick-back. Bonus-sort-of for increased business. It all fitted together so that the customer wanted it to be my company billing them for the goods.

"The way it worked out, they said they could get the intercom from a firm back East. It turned out to be Tredel & Morton. One of their men made all the arrangements with you people, representing me, and getting the priorities. I started getting deliveries, changed the plates, and turned them over to my customer.

"After a while they had all they needed, but I was still getting them from you. Rather than trying to get them to take as many as they had said they wanted, I tried putting them on the market, and found I could handle all you sent. So I just let it ride that way. There's a little profit in them."

Tredel nodded.

"Seems to me you use a lot of spares."

"Spares! No, we don't use any. All the spares are for the original customer. They're probably still selling them to the Navy." Watkins grinned. "There's nothing likely to go wrong with your units that a new tube won't fix. We don't touch the boxes marked SPARES. Just reroute them to Industrial Finance."

Tredel waited until he was away from here to really let his surprise sink in. Industrial Finance! They specialized in long- and short-term loans, any amount, *any* amount, to business firms, factories, wholesalers, chain stores.

They were big. Too big, had too much money. That was his first thought.

Then: Who could do it better, without comment or suspicion? Suppose they wanted something from a manufacturer. The manufacturer had borrowed money from them, was borrowing money, hoped to borrow, or might some day have to borrow. "One of your clients needs such and such? Sure, we'll take care of it. O.K. We'll deliver to you. No, glad to do it." No questions, no suspicions. It would be assumed that Industrial Finance was acting as middleman in a perfectly legitimate deal. Or acting as credit backing for some company that didn't have the cash to put on the line.

They were big. Orders would come down from the top, be lost in the maze of legitimate orders, never be questioned, accepted as a part of the routine. It would take someone —one man, perhaps—at the top—

It was no surprise to find Higgenson Rapid Transit was owned by Industrial Finance.

Many things would be unsurprising now. Tredel was quite sure that if he checked with the Navy he'd

find that they had secured, during the war, a number of Wilson Watkins intercommunications.

Back at home he assembled the components for what he had come to think of as the *T* assembly.

Then he drove out to the country, well away from traffic, and where the woods were thick and owned by Hydraulic Reserve.

He connected the flashlight cell, then pointed the assembly at the woods.

It took about a thousandth of a second, he imagined. There was a clear path through the standing timber. A path thirty feet wide, two miles long. There were great holes in the earth where the roots of trees had been, but no blade of grass nor living matter showed in that thirty-foot width. There was no dust in the air where the trees had been—only the air, clear and very still.

The story was in the paper, three days later. It was written as an oddity, as though the rewrite man didn't expect any reader to take it seriously. A mysterious slash in the forest, forty miles from Temple City, and a few guesses as to what could have caused it.

Someone, Tredel thought, *would know* what *had caused it, and would only want to know* who.

That was what came of being a fool, he told himself. If he had to test the thing, he should have taken it further away. Got deeper in the woods, even. Pointed it toward the ground.

Too late for that. Too late, even, to wonder how the assembly worked.

He could smile grimly over that. He had taken a component of it, imagined the whole assembly before he knew that such existed, and still he did not know why nor how it worked. He had connected it to an electric cell because that was the logical thing to do. Then he had pointed it, and expected something to happen. There was no trigger to press, no mechanism—just the desire that it should operate.

He wondered: How much time? How fast would they move, what would they do? How long would it take to narrow the field down to him?

He started, a dozen times in the next few weeks, to go to Washington. Turn the story and the weapon over to someone in the government. Get some strength on his side.

Yet, he didn't. He would see it through himself. By seeing it through, at that time, meant only waiting until *they* caught up with him. They were bound to, of course. A really efficient organization should have had him before. Put half a dozen factors together and there would be only one person it could be—Jim Tredel. Wait and see what they would do, though. Then it would be time enough—he really didn't think there would be time enough though, to scream for help.

Edith left him on the fourteenth, three days after their first wedding anniversary.

Tredel couldn't blame her, not

even in that first moment, when the first sense of loss and hurt came. He'd had his chance.

There was nothing tearful about it, nothing of a scene. He'd come home from the office. When he entered the front door of the house, he knew she was gone. Not out: Gone. There was a note, very brief, very much to the point: "I'm leaving. You can find me if you ever want to." His name had not been at the beginning, nor here at the end.

There was that moment when he was determined to go after her. Yes, he could find her. Find her and make amends and—

Yes. And tell her what he was up against? Have her around when trouble came? Just as well to have her out of the way.

Still, he surprised Morton. Tredel buckled down to work at the office during the next two months. He knew Morton watched him often, wondering, surprised, but pleased.

For the first time since his return from the army he seemed to take an actual, intelligent interest in the business. He went over sales and sales territories. He talked to the salesmen and got their ideas on products. He made a survey of what they were manufacturing and how they were manufacturing it. He took their fourteen-tube hi-fidelity amplifier over the jumps, adding a compressor and expander circuit, three output channels instead of two. Then he went to work on a new type phono pickup.

And all the time he was waiting for something to happen. Either at the office or at home. The *T* assembly was on his living room table, left there as something of a challenge. Every evening when he returned from the office, it was there. It was still there every morning when he got up.

In two months he revised his former estimates of what he might be facing. From a superefficient organization that took care of all the threads, they had become—what?

He didn't know. There was too much he didn't know. How could they have missed the path in the forest, with its obvious implications?

Unless, the ramifications were so tremendous that they could not keep up with everything.

Or, suppose there was more than one organization?

That didn't add. Somehow, they had missed. They shouldn't have missed. Whatever they were after, the very methods of their operations showed they couldn't afford to miss.

So, at the end of the second month, he went back to his pursuit.

There was no convenient, accidental starting point this time. That one assembly, and its Ts, and Higgenson, and Industrial Finance were traced. The problem then was to trace through Industrial Finance, to see where that would lead him. Or, to assume there were more assemblies, as there must be, more things being made in secret. Try to get one, trail it, see if it also led to Industrial Finance.

Could he expect the system to be

consistent? Suppose he took another manufacturing city. Well, for convenience and possibilities—take Warfield. Companies starting with W. Companies that were served by Higgenson Rapid Transit. Would they be that consistent? If he could get on a trail, would it lead the same way?

He had to consider that it might lead some place else. That there might be something else as big as Industrial Finance involved. That both trails might join and lead some place else.

It took a year for him to pick up the *W* assembly, trace it, very slowly, very carefully, knowing he was on unsurer ground this time, to Industrial Finance, and have the trail stop there, cold.

Still, he had another assembly now. This time it wasn't a weapon. Not exactly. It was a small hand projector that could be pointed at an electric apparatus, and the projector would damp it, stop it cold.

It would stop anything depending on electricity for magnetism, direct power or ignition.

He drove his car into the country, parked it on the side of the road. Then he walked down the road for half a mile. When the way was clear of traffic he turned on the projector for a brief fraction of a second.

When Tredel got back to the car he found the engine dead. He had to be towed back to the city. The car's battery would never again deliver power. The spark plug and ignition points were ruined, the generator useless, all wiring that had carried electricity at the time the projector was turned on was brittle.

He had to assume the same would happen to an airplane, a tank, a battleship—within, of course, the limits of the scope of the projector. He rather imagined that its scope was not too limited.

So the path led to, if not through, Industrial Finance.

He'd hoped there could be a way around. He could foresee difficulties attempting to investigate a company whose business depended upon accurate investigations of its own.

Obvious ideas occurred to him first, to be rejected as swiftly as they came. They could only serve to take time and trouble and money, and to direct suspicion to himself. There was no certainty of any returns.

He saw, after a while, that the workings of Industrial Finance could be very secondary, not in the main line at all. Obviously the corporation itself, as a corporation, was not the ultimate consumer.

He should be able to find where the products went, after they left Industrial Finance. Merely more tracing.

Tredel established as fact that items in which he had an interest, or might have an interest, were invoiced to Industrial Finance, and delivered to various warehouses by Higgenson Rapid Transit.

The warehouses were obviously

under the control of the finance company. However, they were not the sole users of any of them. Dozens of other companies used the same warehouses. It seemed reasonable that it should be to *their* interest that these other companies have no connection with them:

It was some time, much effort wasted, before he could be sure that there was a negative answer to a question to which he had been sure the answer would be affirmative. At last he was sure that Higgenson Rapid Transit took only normal merchandise from the warehouses. They delivered the items he was interested in, but they did not take them away. If anyone did, it was another trucking company.

He found, eventually, that the trucking exclusive ended with the items going into storage. Going out, they were taken by the first trucking company that someone happened to call. It took much checking and following before he could be sure of any one destination.

The Menton Institute was a nonprofit corporation operated for and by the blind. It was quite well known, and employed only the blind in various skilled and nonskilled capacities. So far as Tredel knew they made no products directly for public consumption, but handled a good deal of work for other companies. It had been started by Thomas Menton as a place where the blind could work, earning a living solely through their own productive efforts. The workers were well paid, worked regular hours, and went to their own homes at the end of the shift.

The Institute drew on Industrial Finance warehouses for a good percentage of their work. There was no question of that, once he had narrowed the *T* and *W* assemblies down to them. Trucks left the warehouses with boxes of parts, delivered them to the Menton Institute. Other trucks made pickups, and delivered some place else, not back to the same warehouses.

Tradel didn't try to get into the Institute. It could be assumed that there would be nothing to see in what would be shown him. He could be reasonably sure of the innocence of the Institute itself, but someone would have taken precautions.

He established a position from which he could watch without being seen. Day after day he watched the loading of the trucks from the dock, waiting for a pattern to form.

He could rule out, almost at once, certain of the boxes that left as being probably for legitimate concerns. Then the pattern for which he watched became obvious.

Shipments were made of cartons that seemed to be of uniform size, in cardboard cartons that were of a different shade of yellowish-brown than the usual cartons. These, he saw, were, in addition, all color coded. There were two shipments a day. The first truck took cartons color-coded brown-black-green-red. The second truck took cartons color-coded blue-red-black-orange. He

wondered if there were Braille codes on the cartons corresponding to the colors.

These were the ones he wanted.

He followed the trucks—to another warehouse.

Different, this time, though. The warehouse belonged to a furniture moving and storage company. Tredel didn't like that. He didn't approve of their way of handling this. Surely that would be suspicious to anyone.

There was a small bar-and-grill around the corner from the warehouse. Tredel was there at noon, eating a sandwich and drinking beer.

When a burly man wearing a Tiger Moving & Storage apron came in and sat beside him, it wasn't hard to get a conversation going.

"Sure, there's a job at Tiger. Plenty of them— Hamburger, Bob."

"I don't want to get into moving heavy stuff," Tredel explained. "My back."

The burly man nodded sympathetically, yet eying the bigness of Tredel's body. "Yeah, if you gotta bad back, you gotta watch it all right. Other jobs, though. We do a lot of packing and wrapping. Specialize in it. Plenty of small, too. Sure, that's a big business with us, now. We can do it cheaper than most places can do it themselves. So they give us the business. We pack and wrap. Sometimes address and deliver, too.

"Just about everything. Machinery and electrical stuff and clothes and parts of airplanes. Sometimes whole airplanes—knocked down, of course.

"A lot of stuff, we don't know what it is. We get a lot of stuff that just comes in with color-coding on the cartons. All that stuff gets export-packed. Tropics. Sort of tin foil with cloth backing around the carton. Then Kraft paper. Then a layer of goo. Then wax paper. Then more goo. Then— O, different kinds of goo. Some of it for water-proofing. Some for whatchamacallit fungus protection. Some for other stuff, I guess.

"Then it gets an outside wrapping, and then big numbers are stenciled on it to be like the color-coding. If green-black-red-blue is on the carton we got, then we stencil 5026 on the outside. Then its on its way to South America, or wherever the stuff goes."

That was enough. Tredel didn't lead any further. Thanks, he'd have to go to the employment office and see about a wrapping job.

It wasn't hard to spot the boxes going out. They were all the same size, and had the big numbers stenciled on the sides and ends. Just the numbers were all he could see at the distance.

Higgenson was in the picture. Their trucks made all the pickups. Tredel would have wagered, then, that Higgenson knew as little as Tredel & Morton, or any of the rest.

The trucks picked the boxes up from Tiger, hauled them two-hundred-and-thirty miles, and deposited

them in a seaport warehouse, next to the docks.

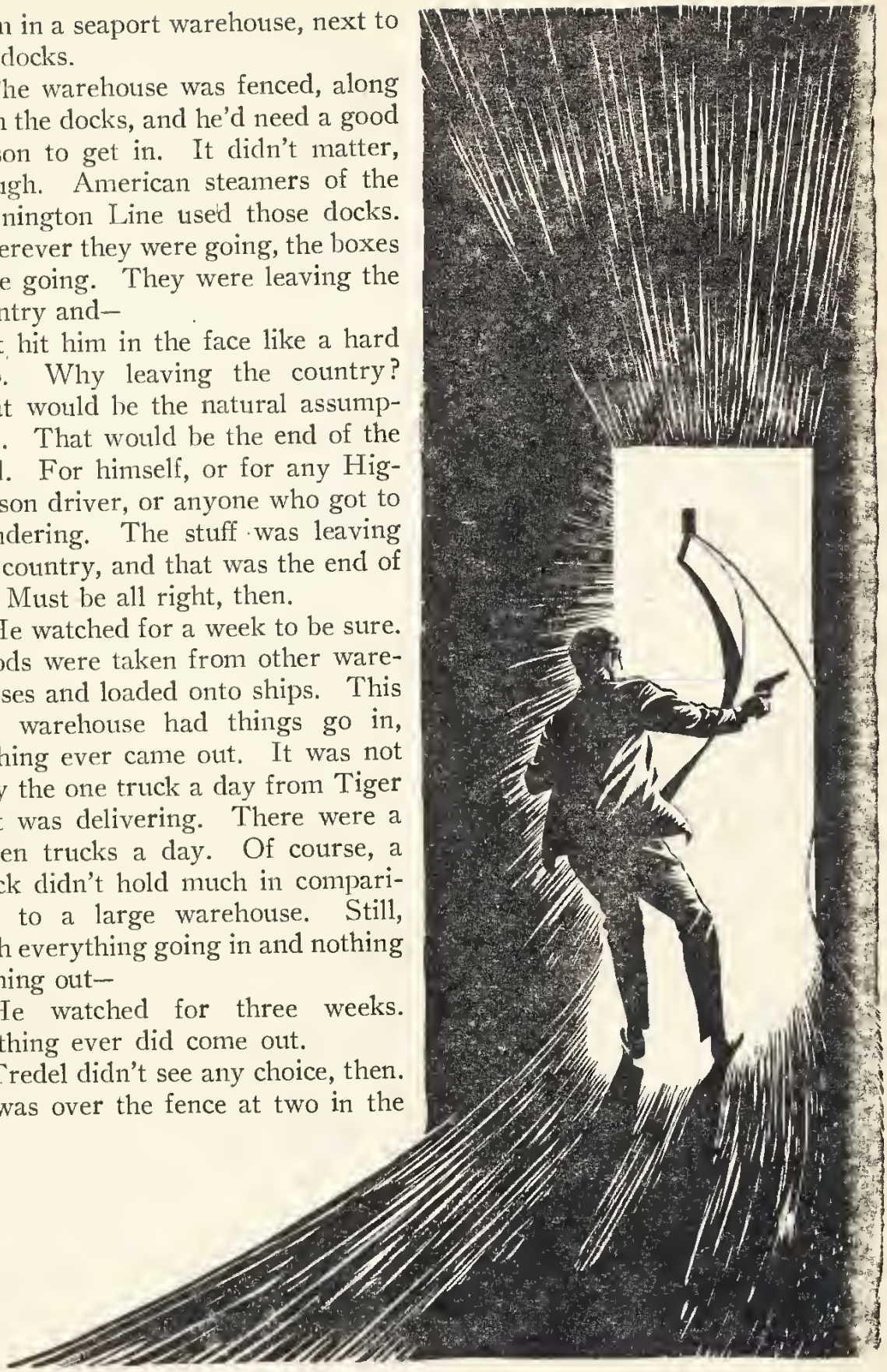
The warehouse was fenced, along with the docks, and he'd need a good reason to get in. It didn't matter, though. American steamers of the Pennington Line used those docks. Wherever they were going, the boxes were going. They were leaving the country and—

It hit him in the face like a hard slap. Why leaving the country? That would be the natural assumption. That would be the end of the trail. For himself, or for any Higgenson driver, or anyone who got to wondering. The stuff was leaving the country, and that was the end of it. Must be all right, then.

He watched for a week to be sure. Goods were taken from other warehouses and loaded onto ships. This one warehouse had things go in, nothing ever came out. It was not only the one truck a day from Tiger that was delivering. There were a dozen trucks a day. Of course, a truck didn't hold much in comparison to a large warehouse. Still, with everything going in and nothing coming out—

He watched for three weeks. Nothing ever did come out.

Tredel didn't see any choice, then. It was over the fence at two in the



morning. The guard would be down at the corner having doughnuts and coffee.

He had a pistol in his pocket when he went over the fence. A pistol, a small flashlight, cigarettes and matches, a wallet with money in it but no identification.

There was barbed wire at the top. Tredel ripped his clothes, tore a gash in his arm. Then he was moving cautiously, yet swiftly, across the yard, dimly lit, toward the warehouse.

He'd never seen the big door that led to the docks closed. They were always slid all the way back, leaving the ramps and dock and conveyor belt clearly visible, easily accessible.

He went that way, because that way was *in,* and in fast. He made a half-jump, half-roll, that took him from the bottom of the descending ramp to the top of the dock. He kept rolling, until he was far back, beyond the dark shadows and in the blackness.

Then he lay there, breathing hard, heart pounding from the exertion but not quieting down. Pumping and breathing to the strain of listening, waiting, and trying to be calm, quiet.

Five minutes, then ten. There was nothing. Nothing except himself in the blackness of the dock. Even then he was telling himself he was a fool. This was too far to have gone on his own. Long before this he should have brought others in, left it to them. This was no place for him. He'd go back, get help.

When he was quiet, he went ahead.

He'd watched the unloading, seen how the place worked. Trucks backed up to the dock, unloaded their cargo. There was an endless belt at the middle of the dock, disappearing into a six-foot square hole in the wall that separated the dock from the rest of the warehouse.

He heard it running now. It always ran, day and night, whether trucks were unloading or not.

Tredel had expected another way into the warehouse. Known there must be one on the dock, out of sight from his watching point. There had to be doors, perhaps at the end of the dock, so that he could get in without going the same way the endless belt did.

There weren't.

He got on the belt, because that was the only way. Just got on the belt and let it carry him, for sure, where he wanted to go. He crouched on it, kneeling, pistol drawn now, feeling little sense of movement, little vibration to the belt as he was carried into the warehouse, into the darkness, away from the light.

Tredel was prepared for almost anything, without having any idea as to what he might expect. He had thought, that, eventually he would get into where the lights were probably burning, and there would be men to handle the boxes—and him.

He seemed to be in a tunnel. Absolute blackness, but he could sense the walls and ceiling, close to him,

stretching behind and before him, hemming him in without recourse, taking him deeper into—he didn't know what.

Then, there was light ahead. He shifted his position on the belt, first to one side, then the other. About six feet between walls, the belt taking up the entire width of the tunnel. He would have to wait, prepared, until he came to the light. Then he would start walking backwards, trying to remain in one place so he could look into the light and see what was there before he himself went in. There was no room to get off the belt. He had to stay on.

It must have been moving much faster than he thought. It was almost, for the moment, as though he had dozed. There was no time to prepare. Suddenly, so suddenly it hurt his eyes, he was out of the black tunnel, in the light.

He was a pigeon on the belt, he knew that. He was off in one quick motion, not pausing to see where he would fall.

It was eight feet from the surface of the belt to the hard, smooth floor on which he landed, and the breath left him in a grunt. He wasn't stiff, his muscles let go, his joints took some of the strain, then folded, so that he was almost in a ball. He rolled like that, then straightened out so he rolled sideways and lost his momentum.

It was luck, wild luck, impossible luck. The warehouse was empty.

Warehouse!

Twenty, thirty, forty warehouses such as he was looking for could be put inside this place. He stared upwards at the ceiling, hundreds of feet above him, then looked to the far walls, a thousand or more feet from him.

Then he rolled again, so that he was under the belt. Small protection—

The belt was going only one way. It was coming into the—room? What was it? The belt was coming in, but there was no return. An endless belt going one way only.

There was a lot to think about, now. Now that it was too late even to begin to think. There was no use starting with the obvious fact that he was in too deep.

What, Tredel wondered, *had he thought he was up against?*

He knew it was something big. The biggest thing in the country outside of the government itself. But he hadn't thought too much, after all, for he had been against only one phase at a time. There had been no sign of counteraction. It was as though he had been against the various segments of an intricate machine, but one that was blind, letting him inspect it at his will, with no powers against him.

There had always been the feeling of menace, but menace without form or shape.

Now—

It couldn't be a secret movement. One with enough followers to support this, would have enough believers to man their own factories.

Their own people could be turning out such weapons as they wanted, without going through the twists and turns for production that he had encountered.

A foreign power— He'd ruled that out time after time. Another country could produce weapons in its own workshops, with far more secrecy than could be obtained here.

The Federal government itself— That was ridiculous.

Actually, his mind was going over the same old tracks again, playing with ideas for which it had no solution. One always had to come back to the cost, the staggering, fantastic cost of production. Under this system the costs were a thousand times what normal production costs would be.

Usually, he played with the ideas, then told himself he would wait and see. Eventually he would find out. Now, it was different. Now he must give up the speculation. There was no telling himself that sooner or later he would know. Now, that he was at the end of the trail, he might never know.

He couldn't hide under the belt forever. Actually, it was practically no protection. Merely a six-foot wide strip that was eight feet high, stretching a thousand feet or more to disappear into the wall on the far side.

It struck him—there were no supports for the belt. It seemed to be self-supporting throughout its length.

The place itself was light, without any sign of a light source, like the early dawn, but brighter. And except for the belt, the light, and himself, the place was empty.

He followed the belt, after awhile, walking beneath it, feeling that that was the only thing to do. He couldn't go back, and there seemed no way out except where the belt went.

He should have stayed on it. For he walked the length—or was it the width?—of the room and he saw no sign of a door opening except for the belt passageway.

The belt had dropped so that here it was about five feet above the floor, instead of eight. He could get back on, be carried where it went. Or wait.

He went back twenty feet, so there would be time to get in position on the belt before he hit the opening in the wall. Then he went to one side, turned, ran easily, and jumped. His hands caught the edge of the belt, his arms contracted, and the momentum of his body was maintained. He was on the surface of the belt again. He reached the center just as he came to the opening in the wall. Twenty feet hadn't been too much. The belt was moving more swiftly than he had thought. Much more swiftly.

He was in a tunnel again. Perhaps it was imagination, but he thought the belt was moving even faster, now. At one point he felt a slight jolt beneath him, and started in alarm. But it was over before he could have taken action. It could have been where one belt ended and

another began, their ends so close together that he hardly felt it as he was transferred from one conveyor to the next.

There was another, similar jolt, this time throwing him forward, so that he thought another transfer had been made, with the new belt moving slower, much slower, than the last. Moving fast, and then transferred, wouldn't there— No, it wouldn't matter. The boxes were loaded as they were taken from the trucks, with quite a bit of time distance between them.

He left the belt when he came again to a light area. This time the belt was only a few inches above the floor, traveling very slowly. It was merely a question of stepping off, pistol in hand, swinging his head as he did so, to take in all possible dangers.

The room, this time, was small— perhaps fifty feet square and thirty feet high. Again there was light, with no sign of the source, and the room was empty. The belt went into the far wall, still without supports. He wondered now, briefly, for the first time about the composition of the belt. Not leather, nor metal— It didn't matter.

There was a doorway, here, to the side of the beltway, in the far wall. A perfectly normal doorway, without a door.

Tredel approached it cautiously, slowly, prepared again for anything. Then he could look in and see the hallway, ten feet wide, ten feet high, stretching hundreds of feet into the distance.

He was watching for light-traps, alarm rays, visible or invisible, whose beams he might break. Apparently there were none, so he stepped into the hall.

He knew that if he were building it himself, he could put in a dozen alarms that could not be detected. The smooth metal walls that seemed without opening could contain an alarm every inch of the way. So it didn't really matter. He could avoid one alarm, and, in so doing, set off a dozen which he didn't suspect. Still he watched.

The hall led to another small room, and there was the belt again, going its endless way. And there was another door, and another hall, and beyond that another room, another door, another hall—

Then he was in the trap. On six sides he was closed in by smooth metal walls, each ten feet from its facing side. Each without break or seam or crack or flaw. He had a pocket handkerchief, a wallet with money in it, a pistol, cigarettes and matches. It was for the first time, there in the darkness of the trap, that he thought of his small flashlight. It was gone, probably lost on the dock, or even fallen when he was getting over the fence.

He lit a match to make sure of the hopelessness of his position. He held the last match long enough to get a cigarette going.

Then he settled down to smoke, and think, and wait and wonder.

He regained consciousness swiftly, almost as though there had been no lapse of time. Things had become different, so there must have been an interval. Still, he had no memory. He had been smoking a cigarette—

He was sitting upright in a chair, and caution told him to make no sudden move. He was in—it seemed more of an office than anything else. Two walls were almost unseen because of the scores of filing cabinets backed against them. One wall was covered with panels on which were dozens of small screens, reminding him of the faces of cathode-ray tubes used for television.

Tredel realized there was a picture on each tube, some of them vaguely familiar. There was the warehouse, and there the first big room the belt had brought him to. There what looked like the hallway—

"It wasn't too much trouble keeping up with you, Mr. Tredel."

He twisted in the chair, so that he could see the desk, and the man sitting behind it.

He was a small man, with a long, lean face, graying hair, and eyes that seemed almost lidless, beady and staring. On the desk Tredel saw his pistol, and, close to it, the man's small hand.

Tredel didn't answer for a moment. Then: "No, I guess not."

"My name is Del," the man behind the desk said. His voice was flat and even, the words unaccented. "*Del* has no meaning to you so far as nationality goes. My face, my body, are essentially North American."

Tredel nodded, feeling stupid, yet with nothing to say.

"I owe you some sort of an explanation," Del continued. "After all, you have expended an amazing amount of time and energy and money to reach me. It is only just that you know what you have come to learn."

"You'll kill me, though." Tredel was just a little pleased with himself about the way he put it into words. Not *dispose,* or get *rid* of—Kill.

Del shook his head and seemed to smile, yet without moving his lips. "No, I can't do that. If it were anyone else—almost anyone else, that is, I'm afraid I would have to kill." At the use of the word he seemed, again, to smile without smiling, as though daring Tredel to take the word back, strip it to its basic meaning, and then apply it personally.

"However, with you, that's not possible. You, along with some twenty or thirty other men I could name, I must consider as unkillable."

Tredel listened, trying to make sense of what Del was saying, telling himself that Del must be making sense, it was just that he wasn't following.

"That doesn't matter for the moment," Del went on. "The important thing is that you are here. I've been fairly certain that eventually you would get here. That's why you made the first part of the

trip from the warehouse and lived.

"We're about twelve hundred miles from the warehouse now. No, you didn't come that far by belt, of course. The conveyor goes into the warehouse, hits a Transmatter—a matter projector—that reassembles inside the tunnel leading to the first cave.

"I see you are willing to accept the idea of the Transmatter. You should— Never mind, however. In the first tunnel there are usually rays in operation to kill all living matter on the belt. It was shut off so that you might come through safely. I was, and am, of the opinion that you must live.

"We're in what once was a series of natural caverns. They've been made over and enlarged rather effectively, as you can see. You only saw the first of the series. Beyond this, where the belt goes, are the storage caverns."

Del pointed to the viewers on the wall. Tredel looked to see that a full score of the scenes were of huge caverns, perhaps larger than the first one in which he had found himself. In each cavern were tremendous stacks of cartons, similar to those he had seen enter the warehouse. He turned back to Del.

"I can't understand— Why?"

"I imagine, Mr. Tredel, that almost every possible solution has occurred to you, and been rejected, except the true one. These are weapons for the future."

"Future!"

"Yes. They will not be used for more than a thousand years, but will sit here, waiting."

Tredel's first mental move was one of absolute negation. "That assumes . . . assumes—"

"Yes. It assumes several things, possibly. One that I am making impossible plans for the future, on the strength of a warped mentality. Or that I might know, actually, what will happen in the future. Or, that I am from the future."

Tredel eyed Del without speaking. There were certain rules his father had given him for solving the problem of a whole. He was trying to remove them from the mechanical class, make them apply to less tangible, less concrete realities.

"Not time travel, Mr. Tredel. *Not* time travel. Not as you might think of it. I was born in the future, raised in the future, and I guess I died in the future. Yet I am here doing the work of the future. But the *I* is only my ego. It is a body and brain born to this time that I am controlling.

"That was a secret we had for some time and—

"I'll tell the story a different way. I'm rather anxious to get your acceptance of myself. I want as little doubt in your mind as possible before—

"You must understand that the Earth of a thousand years from now is very different from the world of today, Mr. Tredel. There are no longer nations and governments. There is one government over all—

a dictator ruling everything. Ruling all of the ten million peoples of Earth.

"It's a hard government, and a cruel one. There is no freedom of action, no freedom of thought, no freedom of education. There is no freedom. It is a place to be born, to live a dull, restricted working life, and die.

"You would call the movement an Underground. There are a lot of us in it. Its purpose is to bring the world back to the glories of the twenty-fifth and twenty-sixth centuries.

"It was . . . is . . . will be a very secret movement, of necessity, lest the Dictatorship uncover some phase of it. Let us use the past tense referring to my part in it. We worked secretly to build an organization that could overthrow the Dictator and return the people, after a time, of course, to their own rule.

"My part in the Underground was not a great one. I was born into it as my parents were members. Then, I was trained for one purpose—to be sent back to the past to do the job I am doing.

"You must understand: We do not have time travel, nor anything approaching it. We had one thing only, and that was a theory worked out by the mathematicians of the Underground: That a human ego could be sent back, to any time in the past, to occupy a human body of that period, and control it.

"Only a theory, yet it was on that we based all our hopes, did all our planning. It could not even be tested. To use it at all meant consumption of a staggering amount of power—power which we could not produce ourselves, and which we would have to steal, at the proper moment, from the public circuits.

"It could be done only once. One run of the ego-translator would use all available power, stolen from forty thousand main beams, and would darken, momentarily, an entire continent. Our own power lines would stand only a fraction of a second. One person could be sent back— The experiment could never be repeated, for after that once all the beams would be so arranged as to shut off automatically on sudden overloads. The Dictator would be unlikely to know what we had done, yet suspicions would be aroused.

"We couldn't build weapons in our own time. We knew what weapons we wanted, but it was impossible to assemble the machinery, to get either power or tools or material. We had to go into the past to build our weapons. Once built, they could not be transported. They would have to be protected against Time, and then hidden so they would be ready for use when we needed them.

"The need wasn't immediate, even when I left. Remember, Mr. Tredel, our revolution would have only one chance, and it must be right the first time. There would be no second. When I left, the day for opening of the storerooms, and distribution of the weapons was still thirty years in

the future. We were planning that far ahead, for the moment when there would be the greatest chance of victory.

"So I was sent back to build these weapons. They had to be built secretly, of course, stored secretly and safely. The site was selected. These caverns were known to exist, from ancient records. It would be necessary to rework them slightly, fill them with our weapons, and seal them against possible discovery.

"My ego . . . consciousness . . . that came to this age was equipped with all required knowledge. I was educated solely to do this job. Therefore, it has been done."

It was almost impossible not to believe, Tredel found. It explained as nothing else would. Still—

"*You* came back? Alone, and—"

Del nodded. "The direction has been mine, though the work has been done by others, of course. To rebuild the caverns as they now are I had knowledge of machinery to do the work. It was only required to have it built to my specifications, and, operated under my instructions—"

"And the operators of the machines?"

"They were hired, did their work, received their pay, and then forgot. None was harmed, but none remembers."

"But why this time? Surely fifty years from now, or a hundred you could have things built with less ef-

fort. Production methods will improve."

"Yes, production methods. But a few years from now will be too late for our purposes. The world is drawing together, even now, becoming organized. Governments will become more centralized, and it will be harder to do things without their knowledge. We don't care about secrecy at this moment. If a thousand, or a million people of today knew what I was doing, it wouldn't matter. What does matter is that there must be no record for the future telling what I have done. It must be a secret, not from the present, but from the future, and only the present can leave records that will tell it to the future. These years now are the last offering permanent secrecy. Therefore this is the time."

Tredel shook his head. "You couldn't bring money back with you, yet all this has cost—a lot," he finished weakly.

"I could bring knowledge. I've been in this time now for more than thirty years. It is only in the last five that I've started to store weapons. Before that, everything was preparation.

"I brought knowledge of what the stock market would do. Of what goods would be scarce in certain years. Of what wars there would be. Of rationing. Knowledge, sure knowledge, was the only thing required to get capital. After that it was simple. Now, under hundreds of names I control thousands of businesses. Each, indirectly and without knowledge, is contributing to the project in some way. I control everything by remote control, with my own knowledge, and with these filing cabinets."

"It's big—too big, for one man to control."

"Yes. I've had to use short cuts. Hundred of them, and many I didn't like. I brought knowledge with me of business machines that would aid, but many of them could not be built in this time. They are just too advanced for present techniques.

"So I've had to use too many short cuts. For the Life Destructor, the weapon that originally aroused your curiosity, I assigned the letter *T*. All parts of it were manufactured in a city beginning with *T*, and companies using it in normal production all started with *T*. It was so with all other weapons. It wasn't a good way, but it cut down my work, made it easier to remember. I don't have the control over this brain that I should have."

"You could have a staff helping you. If you can make people forget what you wish them to—"

"I could hire them and use them, then make them forget afterward. That's true. But what could I do while they were actually working for me? What would protect me against their sabotage, innocent or intentional? There would be suspicions, an utter lack of morale among them, countless errors. Attempts, no doubt, to attack me. It wouldn't work."

Tredel could see that it wouldn't.

"Yet, you would let me live. Even—"

"I can make you forget," Del reminded him. "You will forget everything vital. There's the chance that, some day perhaps under hypnosis, it might come back to you. I think it will, but that's a chance I must take."

"You said you would kill most people."

"Yes. My education of this period went into broad aspects, and specific points such as stock market quotations for certain years. Individuals didn't matter. Still, there were certain things I remembered. When presidents and kings and scientists and people of note would die— History records you as the inventor of the Transmatter in the year 1962—"

"History!"

"Yes. 1962. An important date to be remembered because of the Transmatter. It was one much cruder than that which connects my tunnel to the warehouse. Still, it worked, and it changed civilization more than any one invention ever had. Therefore you were alive in 1962. If I kill you"—Del shrugged—"I don't know, frankly, what would happen. I have no intention of trying to find out. I was warned, specifically, to take no action that would conflict in any way with history as I knew it. We couldn't chance introducing a possible paradox into time-history. We've too much dependent upon this project.

"You see, I couldn't kill you. You must live. Even at the risk of some day remembering. I think that chance is rather strong, in view of the fact that you are to invent—or will it be discover?—the Transmatter. However—"

Tredel's thoughts swung abruptly away, back to the future. "How many are there in your Underground?"

"Approximately a hundred thousand people."

A hundred thousand revolutionists against a world of ten billion! That would mean only one person out of every hundred thousand belonged to the Underground. No wonder they would need such a store of weapons and supplies. One hundred thousand to one!

Tredel's mind worked with the picture, now seen as a whole. He tried to fit the pieces into one certain pattern, so he might be sure.

Then he stood up slowly, stretched, and walked toward the desk. He moved casually, yet not too casually. He stopped when he reached the desk and faced Del. He opened his lips, as though about to speak.

It had to be fast. Even as his fist shot out, moving across the width of the desk, his body was bending forward so his arm would have the range it needed.

Del only half-understood the action. He moved forward slightly to get the pistol, instead of throwing himself back. Tredel's fist caught him on the side of the head, threw him back, overbalancing the chair,

sending him with a crash to the floor.

Tredel had the pistol in his hand, then, and stood, watchfully, waiting for Del to make some movement, watching for some sign that help had been called, or that there might be automatic defenses.

Del lay motionless.

There was a light, strong chain in the desk. Tredel passed it around Del, securing his arms, wondering if the chain had been meant for himself.

Then he stared down. He thought he saw movement. The blow wasn't hard enough to knock Del out, really.

"No use playing, Del. I saw you move."

"You know, I'm sorry on several counts. I wanted to believe in you. If I could have, if you could have trusted in me, I might have helped you. As it is—what can I do?

"Obviously, the weapons you've gathered will have to be destroyed. I can't introduce them to this day and age."

Tredel looked at the screens showing the huge stacks of supplies already gathered.

"I guess that can be done. The boxes can be ripped open, then the caves flooded with water. That should take care of them. That, and Time. Your friends in the Underground will get an awful shock, of course.

"Then I'll have to shut off production, break up your control of companies." He glanced toward the files. "All the information I need should be there. I guess the companies could be given to the employees with the compliments of whatever name you've used in each case. I'll close up your project, Del, once and for all."

He thought of the matter projector—Transmatter. Since history had him as the inventor—or discoverer—perhaps he could— No, that wouldn't be good. Destroy it, then work it out on his own, and come up with the crude form history would tell about.

"I wanted to believe in you, Del. I guess you had a right to succeed, taking the gamble you did, doing what you've done—but I can't see letting a hundred thousand people take over ten billion. Sounds too much like a dictatorship movement of your own.

"If the Dictator is all you say, you had a simpler way out. You didn't have to come back in time and take over a body, build all these weapons. You could have operated in your own time, taken over the body and brain of the Dictator. That would be the easy way to straighten things out. That's what you would have done if the majority of the people would have supported your cause."

He stared at Del, looking for some sign of life, then shrugged and turned to the viewers, studying them, wondering what first step he would take to ruin those vast stacks of supplies showing on the screens, how to shut off the flow of those still

being stacked in place.

He twisted suddenly, looking back at Del, staring at him, searching for the movement that had caused him to turn. He went closer.

Del seemed without life. Tredel sensed the inner struggle of the man, felt the sheer strength of the ego that had come back in time, fought now for control of a body. Tredel stretched his arm forward, touched a finger to the floor close to Del's head, realized for the first time that blood was there, had formed a small pool under the neck arch.

"Tredel . . . Tredel." The voice was weak, coming from lips that scarcely moved, while the rest of Del's face kept the stillness of death. Tredel knew Del had lost the battle to control the body, but was still, somehow, hanging on. He bent lower, listened for another sound from the lips, watched the lips so he might be helped to hear.

"Tredel . . . ask Plato, Caesar, Archimedes— Follow them?"

It took a moment. Then Tredel leaned forward.

"Del!"

Tredel's body was tingling with the shock as his mind sent out the surprise impulses. Ask those two thousand years dead for help— What could even the wise man of 1750 know of the problems of 1950? He would think in terms of men and horses and ships with oars and sails. In terms of a lamp for light and the horizon as a day's journey—

Still, with the training his father had given him— Only extensions were needed, he could make the interpolations— The present manufacturing net work could be used—

Tredel breathed easier.

"Tredel—"

How could this body still be made to speak? Tredel felt as though the words were forming in his mind, and was uncertain of lip movements.

"Tredel— You're right. It would be simpler to take over . . . mind of Dictator. Understand . . . Dictator isn't human."

"I'm— This body . . . dead. Your fight now. Weapons for Guards . . . useless against Dictator. Only one thing—"

A cough, almost mental, ending in a tired, submitting sigh as even mental consciousness left. Tredel continued to kneel after knowing Del could give him no further word.

He could work to make the weapons for others to use against something not human. An organism, perhaps, a machine, a growth, a wave pattern—

Animal, vegetable or mineral?

THE END.

* * * * *

GYPSY

BY POUL ANDERSON

***Colonists** to the far stars must have built-in yearning for the far horizon—the desire to go back of beyond. Some of them, though, may have too much.*

Illustrated by Gaughan

From afar, I caught a glimpse of the *Traveler* as my boat swung toward the planet. The great spaceship looked like a toy at that distance, a frail bubble of metal and air and energy against the enormous background of space. I thought of the machines within her, humming and whirring and clicking very faintly as they pursued their unending round of services, making that long hull into a living world—the hull that was now empty of life—and I had a sudden odd feeling of sympathy. As if she were alive, I felt that the *Traveler* was lonely.

The planet swelled before me, a shining blue shield blazoned with clouds and continents, rolling against a limitless dark and the bitterly burning stars. Harbor, we had named that world, the harbor at the end of our long journey, and there were few lovelier names. Harbor, haven, rest and peace and a sky overhead as roof against the naked blaze

of space. It was good to get home.

I searched the heavens for another glimpse of the *Traveler,* but I couldn't find her tiny form in that thronging wilderness of stars. No matter, she was still on her orbit about Harbor, moored to the planet, perhaps forever. I concentrated on bringing the spaceboat down.

Atmosphere whistled about the hull. After a month in the gloom and poisonous cold of the fifth planet, alone among utterly unhuman natives, I was usually on fire to get home and brought my craft down with a recklessness that overloaded the gravity beams. But this time I went a little more carefully, telling myself that I'd rather be late for supper than not arrive at all. Or perhaps it was that brief chance vision of the *Traveler* which made me suddenly thoughtful. After all, we had had some good times aboard her.

I sent the boat slanting toward the peninsula in the north temperate zone on which most of us were settled. The outraged air screamed behind me as I slammed down on the hard-packed earth that served us for a landing field. There were a few warehouses and service shops around it, long low buildings of the heavy timbers used by most of the colonists, and a couple of private homes a kilometer or so away. But otherwise only long grass rustled in the wind, gardens and wild groves, sunlight streaming out of a high blue sky. When I stepped from the boat, the fresh vivid scent of the land fairly leaped to meet me. I could hear the sea growling beyond the horizon.

Tokogama was on duty at the field. He was sitting on the porch of the office, smoking his pipe and watching the clouds sail by overhead, but he greeted me with the undemonstrative cordiality of old friends who know each other too well to need many words.

"So that's the portmaster," I said. "Soft touch. All you have to do is puff that vile-smelling thing and say hello to me."

"That's all," he admitted cheerfully. "I am retained only for my uncommonly high ornamental value."

It was, approximately, true. Our aircraft used the field with no formality, and we only kept this one space vessel in operation. The portmaster was on hand simply to oversee servicing and in the unlikely case of some emergency or dispute. But none of the colony's few public posts —captain, communications officer, and the rest—required much effort in as simple a society as ours, and they were filled as spare-time occupations by anyone who wanted them. There was no compensation except getting first turn at using the machinery for farming or heavy construction which we owned in common.

"How was the trip?" asked Tokogama.

"Pretty good," I said. "I gave them our machines and they filled my holds with their ores and alloys.

And I managed to take a few more notes on their habits, and establish a few more code symbols for communication."

"Which is a very notable brick added to the walls of science, but in view of the fact that you're the only one who ever goes there it really makes no odds." Tokogama's dark eyes regarded me curiously. "Why do you keep on making those trips out there, Erling? Quite a few of the other boys wouldn't mind visiting Five once in a while. Will and Ivan both mentioned it to me last week."

"I'm no hog," I said. "If either of them, or anyone else, wants a turn at the trading job, let 'em learn space piloting and they can go. But meanwhile—I like the work. You know that. I was one of those who voted to continue the search for Earth."

Tokogama nodded. "So you were. But that was three years ago. Even you must have grown some roots here."

"Oh, I have," I laughed. "Which reminds me I'm hungry, and judging by the sun it's the local dinner time. So I'll get on home, if Alanna knows I'm back."

"She can't help it," he smiled. "The whole continent knows when you're back, the way you rip the atmosphere coming in. That home cooking must have a powerful magnetic attraction."

"A steak aroma of about fifty thousand gauss—" I turned to go, calling over my shoulder: "Why don't you come to dinner tomorrow evening? I'll invite the other boys and we'll have an old-fashioned hot air session."

"I was sort of hinting in that direction," said Tokogama.

I got my carplane out of the hangar and took off with a whisper of air and a hum of grav-beam generators. But I flew low over the woods and meadows, dawdling along at fifty kilometers an hour and looking across the landscape. It lay quietly in the evening, almost empty of man, a green fair breadth of land veined with bright rivers. The westering sun touched each leaf and grass blade with molten gold, an aureate glow which seemed to fill the cool air like a tangible presence, and I could hear the chirp and chatter of the great bird flocks as they settled down in the trees. Yes—it was good to get home.

My own house stood at the very edge of the sea, on a sandy bluff sloping down to the water. The windy trees which grew about it almost hid the little stone and timber structure, but its lawns and gardens reached far, and beyond them were the fields from which we got our food. Down by the beach stood the boathouse and the little dock I had made, and I knew our sailboat lay waiting there for me to take her out. I felt an almost physical hunger for the sea again, the mighty surge of waves out to the wild horizon, the keen salt wind and the crying white birds. After a month in the sterile tanked air of the spaceboat, it was

like being born again.

I set the plane down before the house and got out. Two small bodies fairly exploded against me—Einar and Mike. I walked into the house with my sons riding my shoulders.

Alanna stood in the doorway waiting for me. She was tall, almost as tall as I, and slim and red-haired and the most beautiful woman in the universe. We didn't say much—it was unnecessary, and we were otherwise occupied for the next few minutes.

And afterward I sat before a leaping fire where the little flames danced and chuckled and cast a wavering ruddy glow over the room, and the wind whistled outside and rattled the door, and the sea roared on the nighted beach, and I told them of my fabulous space voyage, which had been hard and monotonous and lonely but was a glamorous adventure at home. The boys' eyes never stirred from my face as I talked, I could feel the eagerness that blazed from them. The gaunt sun-seared crags of One, the misty jungles of Two, the mountains and deserts of Four, the great civilization of Five, the bitter desolation of the outer worlds—and beyond those the stars. But we were home now, we sat in a warm dry house and heard the wind singing outside.

I was happy, in a quiet way that had somehow lost the exuberance of my earlier returns. Content, maybe.

Oh, well, I thought. These trips to the fifth world were becoming routine, just as life on Harbor, now that our colony was established and our automatic and semiautomatic machines running smoothly, had quieted down from the first great riot of work and danger and work again. That was progress, that was what we had striven for, to remove want and woe and the knife-edged uncertainty which had haunted our days. We had arrived, we had graduated into a solid assurance and a comfort which still held enough unsureness and challenge to keep us from getting sluggish. Grown men don't risk their necks climbing the uppermost branches of trees, the way children do; they walk on the ground, and when they have to rise they do so safely and comfortably, in a carplane.

"What's the matter, Erling?" asked Alanna.

"Why—nothing." I started out of my reverie, suddenly aware that the children were in bed and the night near its middle. "Nothing at all. I was just sitting thinking. A little tired, I guess. Let's turn in."

"You're a poor liar, Erling," she said softly. "What were you really thinking about?"

"Nothing," I insisted. "That is, well, I saw the old *Traveler* as I was coming down today. It just put me in mind of old times."

"It would," she said. And suddenly she sighed. I looked at her in some alarm, but she was smiling again. "You're right, it is late, and we'd better go to bed."

I took the boys out in the sailboat the next day. Alanna stayed home

on the excuse that she had to prepare dinner, though I knew of her theory that the proper psychodevelopment of children required a balance of paternal and maternal influence. Since I was away so much of the time, out in space or with one of the exploring parties which were slowly mapping our planet, she made me occupy the center of the screen whenever I was home.

Einar, who was nine years old and getting interested in the microbooks we had from the *Traveler*—and so, ultimately, from Earth—looked at her and said: "Back at Sol you wouldn't have to make food, Mother. You'd just set the au . . . autochef, and come out with us."

"I like to cook," she smiled. "I suppose we could make autochefs, now that the more important semi-robot machinery has been produced, but it'd take a lot of fun out of life for me."

Her eyes went past the house, down to the beach and out over the restless sun-sparked water. The sea breeze ruffled her red hair, it was like a flame in the cool shade of the trees. "I think they must miss a lot in the Solar System," she said. "They have so much there that, somehow, they can't have what we've got—room to move about, lands that never saw a man before, the fun of making something ourselves."

"You might like it if you went there," I said. "After all, sweetheart, however wisely we may talk about Sol we know it only by hearsay."

"I know I like what we have here," she answered. I thought there was a faint note of defiance in her voice. "If Sol is just a legend, I can't be sure I'd like the reality. Certainly it could be no better than Harbor."

"All redheads are chauvinists," I laughed, turning down toward the beach.

"All Swedes make unfounded generalizations," she replied cheerfully. "I should'a known better than to marry a Thorkild."

"Fortunately, Mrs. Thorkild, you didn't," I bowed.

The boys and I got out the sailboat. There was a spanking breeze, and in minutes we were scudding northward, along the woods and fields and tumbling surf of the coast.

"We should put a motor on the *Naughty Nancy,* Dad," said Einar. "Suppose this wind don't hold."

"I like to sail," I said. "The chance of having to man the sweeps is part of the fun."

"Me too," said Mike, a little ambiguously.

"Do they have sailboats on Earth?" asked Einar.

"They must," I said, "since I designed the *Nancy* after a book about them. But I don't think it'd ever be quite the same, Einar. The sea must always be full of boats, most of them powered, and there'd be aircraft overhead and some sort of building wherever you made landfall. You wouldn't have the sea to yourself."

"Then why'd you want to keep looking for Earth when ever'body

else wanted to stay here?" he challenged.

A nine-year-old can ask some remarkably disconcerting questions. I said slowly: "I wasn't the only one who voted to keep on searching. And—well, I admitted it at the time, it wasn't Earth but the search itself that I wanted. I liked to find new planets. But we've got a good home now, Einar, here on Harbor."

"I still don't understand how they ever lost Earth," he said.

"Nobody does," I said. "The *Traveler* was carrying a load of colonists to Alpha Centauri—that was a star close to Sol—and men had found the hyperdrive only a few years before and reached the nearer stars. Anyway, *something* happened. There was a great explosion in the engines, and we found ourselves somewhere else in the Galaxy, thousands of light-years from home. We don't know how far from home, since we've never been able to find Sol again. But after repairing the ship, we spent more than twenty years looking. We never found home." I added quickly, "Until we decided to settle on Harbor. That was our home."

"I mean, how'd the ship get thrown so far off?"

I shrugged. The principles of the hyperdrive are difficult enough, involving as they do the concept of multiple dimensions and of discontinuous psi functions. No one on the ship—and everyone with a knowledge of physics had twisted his brains over the problem—had been able to figure out what catastrophe it was that had annihilated space-time for her. Speculation had involved space warps—whatever that term means, points of infinite discontinuity, undimensional fields, and Cosmos knows what else. Could we find what had happened, and purposefully control the phenomenon which had seized us by some blind accident, the Galaxy would be ours. Meanwhile, we were limited to pseudovelocities of a couple of hundred lights, and interstellar space mocked us with vastness.

But how explain that to a nine-year-old? I said only: "If I knew that, I'd be wiser than anyone else, Einar. Which I'm not."

"I wanna go swimming," said Mike.

"Sure," I said. "That was our idea, wasn't it? We'll drop anchor in the next bay—"

"I wanna go swimming in Spacecamp Cove."

I tried to hedge, but Einar was all over me, too. It was only a few kilometers farther up the coast, and its broad sheltered expanse, its wide sandy beach and the forest immediately behind, made it ideal for such an expedition. And after all, I had nothing against it.

Nothing—except the lure of the place.

I sighed and surrendered. Spacecamp Cove it was.

We had a good time there, swimming and picnicking, playing ball and loafing in the sand and swim-

ming some more. It was good to lie in the sun again, with a cool wet wind blowing in from the sea and talking in the trees. And to the boys, the glamour of it was a sort of crown on the day.

But I had to fight that romance. I wasn't a child any more, playing at spacemen and aliens, I was a grown man with some responsibilities. The community of the *Traveler* had voted by an overwhelming majority to settle on Harbor, and that was that.

And here, half hidden by long grass, half buried in the blowing sand, were the unmistakable signs of what we had left.

There wasn't much. A few plasticontainers for food, a couple of broken tools of curious shape, some scattered engine parts. Just enough to indicate that a while ago—ten years ago, perhaps—a party of spacemen had landed here, camped for a while, made some repairs, and resumed their journey.

They weren't from the fifth planet. Those natives had never left their world, and even with the technological impetus we were giving them in exchange for their metals they weren't ever likely to, the pressures they needed to live were too great. They weren't from Sol, or even some colony world—not only were the remains totally unlike our equipment, but the news of a planet like Harbor, almost a duplicate of Earth but without a native intelligent race, would have brought settlers here in swarms. So—somewhere in the Galaxy, someone else had mastered the hyperdrive and was exploring space.

As we had been doing—

I did my best to be cheerful all the way home, and think I succeeded on the surface. And that in spite of Einar's wildly romantic gabble about the unknown campers. But I couldn't help remembering—

In twenty years of spacing, you can see a lot of worlds, and you can have a lot of experience. We had been gods of a sort, flitting from star to star, exploring, trading, learning, now and again mixing into the destinies of the natives. We had fought and striven, suffered and laughed and stood silent in wonder. For most of us, the dreadful hunger for home, the weariness of the hopeless quest, had shadowed that panorama of worlds which reeled through my mind. But—before Cosmos, I had loved every minute of it!

I fell into unrelieved moodiness as soon as we had stowed the *Naughty Nancy* in our boathouse. The boys ran ahead of me toward the house, but I followed slowly. Alanna met me at the door.

"Better wash up right away," she said. "The company will be here any minute."

"Uh-huh."

She looked at me, for a very long moment, and laid her hand on my arm. In the long dazzling rays of the westering sun, her eyes were brighter than I had seen them before. I wondered if tears were not waver-

ing just behind them.

"You were at Spacecamp Cove," she said quietly.

"The boys wanted to go there," I answered. "It's a good place."

"Erling—" She paused. I stood looking at her, thinking how beautiful she was. I remembered the way she had looked on Hralfar, the first time I kissed her. We had wandered a ways from the camp of the detail exploring that frosty little world and negotiating with its natives for supplies. The sky had been dark overhead, with a shrunken sun casting its thin pale light on the blue-shadowed snow. It was quiet, breathlessly quiet, the air was like sharp fire in our nostrils and her hair, the only color in that white horizon, seemed to crackle with frost. That was quite a long time ago, but nothing had changed between us since.

"Yes?" I prompted her. "Yes, what is it?"

Her voice came quickly, very low so the boys wouldn't hear: "Erling, are you really happy here?"

"Why"—I felt an almost physical shock of surprise—"of course I am, dear. That's a silly question."

"Or a silly answer?" She smiled, with closed lips. "We did have some good times on the *Traveler*. Even those who grumbled loudest at the time admit that, now when they've got a little perspective on the voyage and have forgotten something of the overcrowding and danger and weariness. But you—I sometimes think the *Traveler* was your life, Erling."

"I liked the ship, of course." I had a somewhat desperate sense of defending myself. "After all, I was born and raised on her. I never really knew anything else. Our planetary visits were so short, and most of the worlds so unterrestrial. You liked it, too."

"Oh, sure, it was fun to go batting around the Galaxy, never knowing what might wait at the next sun. But a woman wants a home. And—Erling, plenty of others your age, who also had never known anything else, hated it."

"I was lucky. As an officer, I had better quarters, more privacy. And, well, that 'something hid behind the ranges' maybe meant more to me than to most others. But—good Cosmos, Alanna! you don't think that now—"

"I don't think anything, Erling. But on the ship you weren't so absent-minded, so apt to fall into daydreams. You didn't sit around the

place all day, you were always working on something—" She bit her lip. "Don't misunderstand, Erling. I have no doubt you keep telling yourself how happy you are. You could go to your cremation, here on Harbor, thinking you'd had a rather good life. But—I sometimes wonder!"

"Now look—" I began.

"No, no, nothing more out of you. Get inside and wash up, the company'll be coming in half a minute."

I went, with my head in a whirl. Mechanically, I scrubbed myself and changed into evening blouse and slacks. When I came out of the bedroom, the first of the guests were already waiting.

MacTeague Angus was there, the old first mate of the *Traveler* and captain in the short time between Kane's death and our settling on Harbor. So was my brother Thorkild Gustav, with whom I had little in common except a mutual liking. Tokogama Hideyoshi, Petroff Ivan, Ortega Manuel, and a couple of others showed up a few minutes later. Alanna took charge of their wives and children, and I mixed drinks all around.

For a while the talk was of local matters. We were scattered over quite a wide area, and had as yet not produced enough telescreens for every house, so that communication was limited to direct personal travel by plane. A hailstorm on Gustav's farm, a minor breakdown in the vehicle factory superintended by Ortega, Petroff's project of a fleet of semirobot fishing boats—small gossip. Presently dinner was served.

Gustav was rapturous over the steak. "What is it?" he asked.

"Some local animal I shot the other day," I said. "Ungulate, reddish-brown, broad flat horns."

"Oh, yes. Hm-m-m—I'll have to try domesticating some. I've had pretty good luck with those gluggugs."

"Huh?" Petroff stared at him.

"Another local species," laughed Gustav. "I had to call them something, and they make that kind of noise."

"The *Traveler* was never like this," said Ortega, helping himself to another piece of meat.

"I never thought the food was bad," I said.

"No, we had the hydroponic vegetables and fruits, and the synthetic meats, as well as what we picked up on different planets," admitted Ortega. "But it wasn't this good, ever. Hydroponics somehow don't have the flavor of Earth-grown stuff."

"That's your imagination," said Petroff. "I can prove—"

"I don't care what you can prove, the facts remain." Ortega glanced at me. "But there were compensations."

"Not enough," muttered Gustav. "I've got room to move, here on Harbor."

"You're being unjust to the *Traveler*," I said. "She was only meant to carry about fifty people, for a short voyage at that. When she

lost her way for twenty years, and a whole new generation got jammed in with their parents, it's no wonder she grew crowded. Actually, her minimum crew is ten or so. Thirty people—fifteen couples, say, plus their kids—could travel in her in ease and comfort, with private apartments for all."

"And still . . . still, for over twenty years, we fought and suffered and stood the monotony and the hopelessness—to find Earth." Tokogama's voice was musing, a little awed. "When all the time, on any of a hundred uninhabited terrestroid planets, we could have had—this."

"For at least half that time," pointed out MacTeague, "we were simply looking for the right part of the Galaxy. We knew Sol wasn't anywhere near, so we had no hopes to be crushed, but we thought as soon as the constellations began to look fairly familiar we'd be quickly able to find home." He shrugged. "But space is simply too big, and our astrogational tables have so little information. Star travel was still in its infancy when we left Sol.

"An error of, say, one percent could throw us light-years off in the course of several hundred parsecs. And the Galaxy is lousy with GO-type suns, which are statistically almost certain to have neighbors sufficiently like Sol's to fool an unsure observer. If our tables had given positions relative to, say, S Doradus, we could have found home easily enough. But they used Sirius for their bright-star point—and we couldn't find Sirius in that swarm of stars! We just had to hop from star to star which *might* be Sol—and find it wasn't, and go on, with the sickening fear that maybe we were getting farther away all the time, maybe Sol lay just off the bows, obscured by a dark nebula. In the end—we gave it up as a bad job."

"There's more to it than that," said Tokogama. "We realized all that, you know. But there was Captain Kane and his tremendous personality, his driving will to success, and we'd all come to rely more or less blindly on him. As long as he lived, nobody quite believed in the possibility of failure. When he died, everything seemed to collapse at once."

I nodded grimly, remembering those terrible days that followed—Seymour's mutinous attempt to seize power, bringing home to us just how sick and weary we all were; the arrival at this star which might have solved it all, might have given us a happy ending, if it had been Sol; the rest on Harbor, a rest which became a permanent stay—

"Something else kept us going all those years, too," said Ortega quietly. "There was an element among the younger generation which liked to wander. The vote to stay here wasn't unanimous."

"I know," said MacTeague. His level gaze rested thoughtfully on me. "I often wonder, Erling, why some of you don't borrow the ship and visit the nearer stars, just to see what's there."

"Wouldn't do any good," I said tonelessly. "It'd just make our feet itch worse than ever—and there'd always be stars beyond those."

"But why—" Gustav fumbled for words. "Why would anyone *want* to go—stargazing that way? I . . . well, I've got my feet on ground now, my own ground, my own home . . . it's growing, I'm building and planting and seeing it come to reality before my own eyes, and it'll be there for my children and their children. There's air and wind and rain, sunlight, the sea, the woods and mountains—Cosmos! Who wants more? Who wants to trade it for sitting in a sterile metal tank, riding from star to star, homeless, hopeless?"

"Nobody," I said hastily. "I was just trying—"

"The most pointless existence—simply to be a . . . a spectator in the universe!"

"Not exactly," said Tokogama. "There was plenty we did, if you insist that somebody must do something. We brought some benefits of human civilization to quite a number of places. We did some extensive star-mapping, if we ever see Earthmen again they'll find our tables useful, and our observations within different systems. "We . . . well, we were wanderers, but so what? Do you blame a bird for not having hoofs?"

"The birds have hoofs now," I said. "They're walking on the ground. And"—I flashed a glance at Alanna—"they like it."

The conversation was getting a little too hot. I steered it into safer channels until we adjourned to the living room. Over coffee and tobacco it came back.

We began reminiscing about the old days, planets we had seen, deeds we had done. Worlds and suns and moons, whirling through a raw dark emptiness afire with stars, were in our talk—strange races, foreign cities, lonely magnificence of mountains and plains and seas, the giant universe opening before us. Oh, by all the gods, we had fared far!

We had seen the blue hell-flames leaping over the naked peaks of a planet whose great sun almost filled its sky. We had sailed with a gang of happy pirates over a sea red as new-spilled blood toward the grotesque towers of a fortress older than their history. We had seen the rich color and flashing metal of a tournament on Drangor and the steely immensity of the continental cities on Alkan. We had talked philosophy with a gross wallowing cephalopod on one world and been shot at by the inhumanly beautiful natives of another. We had come as gods to a planet to lift its barbaric natives from the grip of a plague that scythed them down and we had come as humble students to the ancient laboratories and libraries of the next. We had come near perishing in a methane storm on a planet far from its sun and felt then how dear life is. We had lain on the beaches of the paradise world Luanha and let the sea sing us to sleep. We had ridden

centauroids who conversed with us as they went to the aerial city of their winged enemies—

More than the wildly romantic adventures—which, after all, had been pretty dirty and bloody affairs at the time—we loved to remember the worlds themselves: a fiery sunset on the snowfields of Hralfar; a great brown river flowing through the rain forest which covered Atlang; a painted desert on Thyvari; the mighty disk of New Jupiter swelling before our bows; the cold and vastness and cruelty and emptiness and awe and wonder of open space itself. And, in our small clique of frank tramps, there had been the comradeship of the road, the calm unspoken knowledge of having friends who would stand firm—a feeling of *belonging,* such as men like Gustav had achieved only since coming here, and which we seemed to have lost.

Lost—yes, why not admit it? We didn't see each other very often any more, we were too scattered, too busy. And the talk of the others was just a little bit boring.

Well, it couldn't be helped—

It was late that night when the party broke up. Alanna and I saw the guests out to their planes. When the last vehicle had whispered into the sky, we stood for a while looking around us. The night was very still and cool, with a high starry sky in which the moon of Harbor was rising. Its light glittered on the dew under our feet, danced restlessly on the sea, threw a dim silver veil on the dreaming land—our land.

I looked down at Alanna. She was staring over the darkened view, staring as if she had never seen it before—or never would again. The moonlight was tangled like frost in her hair. *What if I never see open space again? What if I sit here till I die? This is worth it.*

She spoke at last, very slowly, as if she had to shape each word separately: "I'm beginning to realize it. Yes, I'm quite sure."

"Sure of what?" I asked.

"Don't play dumb. You know what I mean. You and Manuel and Ivan and Hideyoshi and the others who were here—except Angus and Gus, of course. And quite a few more. You don't belong here. None of you."

"How—so?"

"Look, a man who had been born and raised in a city, and had a successful life in it, couldn't be expected to take to the country all of a sudden. Maybe never. Put him among peasants, and he'd go around all the rest of his life wondering vaguely why he wasn't honestly happy."

"We— Now don't start that again, sweetheart," I begged.

"Why not? Somebody's got to. After all, Erling, this is a peasantry we've got, growing up on Harbor. More or less mechanized, to be sure, but still rooted to the soil, close to it, with the peasant strength and solidity and the peasant's provincial outlook. Why, if a ship from Earth landed tomorrow, I don't think

twenty people would leave with it.

"But you, Erling, you and your friends—you grew up in the ship, and you made a successful adaptation to it. You spent your formative years wandering. By now—you're cosmopolites. For you, a mountain range will always be more than it really is, because of what's behind it. One horizon isn't enough, you've got to have many, as many as there are in the universe.

"Find Earth? Why, you yourself admitted you don't care whether Earth is ever found. You want only the search.

"You're a gypsy, Erling. And no gypsy could ever be tied to one place."

I stood for a long while, alone with her in the cold calm moonlight, and said nothing. When I looked down at her, finally, she was trying not to cry, but her lip was trembling and the tears were bright in her eyes. Every word was wrenched out of me:

"You may be right, Alanna. I'm beginning to be horribly afraid you are. But what's to be done about it?"

"Done?" She laughed, a strangely desolate laugh. "Why, it's a very simple problem. The answer is circling right there up in the sky. Get a crew who feel the way you do, and take the *Traveler*. Go roaming—forever!"

"But . . . you? You, the kids, the place here . . . you—"

"Don't you see?" Her laughter rang louder now, echoing faintly in the light night. "Don't you see? I want to go, too!" She almost fell into my arms. "I want to go, too!"

There is no reason to record the long arguments, grudging acceptances, slow preparations. In the end we won. Sixteen men and their wives, with half a dozen children, were wild to leave.

That summer blazed up into fall, winter came, spring, and summer again, while we made ready. Our last year on Harbor. And I had never realized how much I loved the planet. Almost, I gave up.

But space, free space, the open universe and the ship come alive again—!

We left the colony a complete set of plans, in the unlikely event that they should ever want to build a starship of their own, and a couple of spaceboats and duplicates of all the important automatic machinery carried by the *Traveler*. We would make astrogating tables, as our official purpose, and theoretically we might some day come back.

But we knew we never would. We would go traveling, and our children would carry the journey on after us, and their children after them, a whole new civilization growing up between the stars, rootless but tremendously alive. Those who wearied of it could always colonize a planet, we would be spreading mankind over the Galaxy. When our descendants were many, they would build other ships until there was a fleet, a mobile city hurtling from sun to sun. It

would be a culture to itself, drawing on the best which all races had to offer and spreading it over the worlds. It would be the bloodstream of the interstellar civilization which was slowly gestating in the universe.

As the days and months went by, my boys grew ever more impatient to be off. I smiled a little. Right now, they only thought of the adventure of it, romantic planets and great deeds to be done. Well, there were such, they would have eventful lives, but they would soon learn that patience and steadfastness were needed, that there was toil and suffering and danger—and life!

Alanna—I was a little puzzled. She was very gay when I was around, merrier than I had ever seen her before. But she often went out for long walks, alone on the beach or in the sun-dappled woods, and she started a garden which she would never harvest. Well—so it went, and I was too busy with preparations to think much about it.

The end came, and we embarked on the long voyage, the voyage which has not ceased yet and, I hope, will never end. The night before, we had Angus and Gustav in for a farewell party, and it was a strange feeling to be saying good-by knowing that we would never see them again, or hear from them. It was like dying.

But we were alone in the morning. We went out to our carplane, to fly to the landing field where the gypsies would meet. From there, a boat would take us to the *Traveler*. I still could not fully realize that I was captain—I, captain of the great ship which had been my world, it didn't seem real. I walked slowly, my head full of the sudden universe of responsibility.

Alanna touched my arm. "Look around, Erling," she whispered. "Look around at our land. You'll never see it again."

I shook myself out of my reverie and let my eyes sweep the horizon. It was early, the grass was still wet, flashing in the new sun. The sea danced and glittered beyond the rustling trees, crying its old song to the fair green land, and the wind that blew from it was keen and cold and pungent with life. The fields were stirring in the wind, a long ripple of grass, and high overhead a bird was singing.

"It's—very beautiful," I said.

"Yes." I could hardly hear her voice. "Yes, it is. Let's go, Erling."

We got into the carplane and slanted skyward. The boys crowded forward with me, staring ahead for the first glimpse of the landing field, not seeing the forests and meadows and shining rivers that slipped away beneath us.

Alanna sat behind me, looking down over the land. Her bright head was bent away so I couldn't see her face. I wondered what she was thinking, but somehow I didn't want to ask her.

THE END

OLE MOTHER METHUSELAH

BY RENÉ LAFAYETTE

Old Doc had his hands full. The attendant had made a mistake, it seemed—raising human embryos in lion-embryo serums produced the most inhuman bratlings!

Illustrated by Cartier

Bucketing along at a hundred and fifty light-years, just entering the Earth Galaxy, the *Morgue,* decrepit pride of the Universal Medical Society, was targeted with a strange appeal.

ANY UMS SHIP ANY UMS SHIP ANY DOCTOR ANYONE EMERG EMERG EMERG PLEASE CONTACT PLEASE CONTACT UNITED STATES EXPERIMENTAL STATION THREE THOUSAND AND TWO PLANET GORGON BETA URSUS MAJOR. RELAY RELAY EMERG.

Ole Doc was in his salon, boots on a gold-embroidered chair, head reclined against a panel depicting the Muses crowning a satyr, musing upon the sad and depleted state of his wine "cellar" which jingled and rattled, all two bottles of it, on a shelf above the coffeemaker. He heard the tape clicking but he had heard tapes click before. He heard it clicking the distinctive three dots of an emergency call but he had heard that before also.

"Hippocrates!" he bellowed. And after a silence of two days the loudness and suddenness of this yell brought the little slave out of his galley as though shot from a gun.

Four-armed, antennaed and indestructible, little Hippocrates was not

easily dismayed. But now he was certain that they were hard upon a dead star—nay, already struck.

"Master?"

"Hippocrates," said Ole Doc, "we've only got two bottles of wine left!"

Hippocrates saw that the ship was running along on all drives, that the instrument panel, which he could see from where he stood in the passage, half a ship length forward from the salon, was burning green on all registers, that they were on standard speed and that, in short, all was well. He wiped a slight smear of mustard and gypsum from his mouth with a guilty hand—for his own supplies of delicacy were so low that he had stolen some of Ole Doc's plaster for casts.

"The formula for making wine," began Hippocrates with his phonograph record-wise mind, "consists of procuring grapes. The grapes are then smashed to relieve them of juice and the juice is strained and set aside to ferment. At the end of—"

"We don't have any grapes," said Ole Doc. "We don't have any fuel. We have no food beyond ham and powdered eggs. All my shirts are in ribbons—"

"If you would stop writing on the cuffs," said Hippocrates, "I might—"

"—and I have not been fishing for a year. See what's on that tape. If

it's good fishing and if they grow grapes, we'll land."

Hippocrates knew something had been bothering him. It was the triple click of the recording receiver. Paper was coming out of it in a steady stream. *Click, click, click.* Emerg. Emerg. Emerg!

Ole Doc looked musingly at the Muses and slowly began to relax. That was a good satyr Joccini had done, even if it was uncomfortably like—

"United States Experimental Station on Gorgon Beta Ursus Major," said Hippocrates. "Direct call to UMS, master." He looked abstractedly at the dark port beyond which the stars flew by. Through his mind was running the "Star Pilot for Ursus Major." He never forgot anything, Hippocrates, and the eighteen thousand close-packed pages whirred by, stopped, turned back a leaf and then appeared in his mind. "It's jungle and rivers. Wild game. Swamps." And he brightened. "No women."

"What?" said Ole Doc incuriously.

"Gorgon of Beta Ursus Major. Lots of fish. Lots of them. And wine. Lots of fish and wine."

Ole Doc got up, stretched and went forward. He punched a pneumatic navigator and after divers whirs and hisses a light flashed on a screen giving him a new course departing from a point two light-years in advance of the reading. He could not turn any sooner. He settled himself under the familiar controls, disconnected the robot and yawned.

Two days later they were landing on Field 1,987,806 United States Army Engineers, Unmanned, half an hour's jaunt from United States Experimental Station 3,002.

Ole Doc let Hippocrates slide the ladder out and stood for a moment in the air lock, black kit in hand. The jungle was about three hundred feet above the edges of the field, a wild and virulent jungle, dark green with avid growing and yellow with its rotting dead. For a little space there was complete silence while the chattering gusts of the landing jets echoed out and left utter stillness. And then the jungle came awake once more with screams and catcalls and a ground-shaking *aa-um.*

Hippocrates skittered back up the ladder. He stopped at the top. Again sounded the *aa-um* and the very plates of the old ship shook with it. Hippocrates went inside and came back with a hundred and ten millimeter turret cannon cradled comfortably over his two right arms.

Ole Doc threw a switch which put an alpha force field around the ship to keep wild animals off and, with a final glance at the tumbled wrecks of buildings which had once housed a military post, descended the ladder and strolled after Hippocrates into the thick growth.

Now and then Hippocrates cocked an antenna at the towering branches overhead and stopped suspiciously. But he could see nothing threatening and he relieved his feelings occasionally by sending a big gout of fire from the 110 to sizzle them out a

straight trail and calcine the mud to brick hardness.

Aa-um shook the jungle. And each time it sounded the myriad of animal and bird noises fell still for a moment.

Hippocrates was about to send another shot ahead when Ole Doc stopped him. An instant later a gray-faced Irishman with wild welcome in his eyes broke through the sawtrees to clasp Ole Doc in emotional arms.

"I'm O'Hara. Thank God I got through. Receiver's been out for six months. Didn't know if I was getting a signal out. Thank God you've come!" And he closed for another embrace but Ole Doc forestalled him by calling attention to the *aa-um* which had just sounded once more.

"Oh that!" said O'Hara. "That's a catbeast. Big and worry enough when I've got time to worry about them. Oh, for the good old days when all I had to worry about was catbeast getting my cattle and mesohawks my sheep. But now—" And he started off ahead of them at a dead run, beckoning them to hasten after him.

They had two close calls from swooping birds as big as ancient bombers and almost took a header over a tree trunk ten feet through which turned out to be a snake rising from the ooze with big, hungry teeth. But they arrived in a moment at the station all in one piece.

"You've got to understand," panted O'Hara when he found Ole Doc wouldn't run any faster, "that I'm the only man here. I have some Achnoids, of course, but you would not call those octopi company even if they can talk and do manual labor. But I've been here on Gorgon for fifteen years and I never had anything like this happen before. I am supposed to make this planet habitable in case Earth ever wants a colony planted. This is an agricultural and animal husbandry station. I'm supposed to make things easy for any future colonist. But no colonists have come so far and I don't blame them. This Savannah here is the coolest place on the planet and yet it's hot enough. But I haven't got an assistant or anyone and so when this happened—"

"Well, come on, man," said Ole Doc. "What *has* happened."

"You'll see!" cried O'Hara, getting wild-eyed with excitement and concern once more. "Come along."

They entered a compound which looked like a fortress. It sat squarely in the center of a huge grassy field, the better to have its animal targets in the open when they attacked and the better to graze its livestock. As they passed through the gate, O'Hara carefully closed it behind him.

Ole Doc looked incuriously at the long lines of sheds, at the helio motors above each and the corrals where fat cattle grazed. A greenhouse caught his interest because he saw that an Achnoid, who more closely resembled a blue pinwheel than a man, was weeding valuable medicinal herbs from out of, as Ole

Doc saw it, worthless carrots. But O'Hara dragged him on through the noisy heat and dust of the place until they stood at Shed Thirteen.

"This is the lion shed," said O'Hara.

"Interesting," said Ole Doc disinterestedly.

O'Hara opened the door. A long row of vats lined each side of the passage and the sound of trickling fluid was soothing as it ran from one to the next. A maze of intricate glass tubing interconnected one vat to the next and a blank-beaked Achnoid was going around twiddling valves and reading temperatures.

"Hm-m-m," said Ole Doc. "Artificial birthing vats."

"Yes, yes. To be sure!" cried O'Hara in wild agreement, happy that he was getting some understanding. "That's the way we get our stock. Earth sends me sperm and ovums in static ray preservation and I put them into the vats and bring them to maturity. Then we take them out of the vats and put them on artificial udders and we have calves and lambs and such. But this is the lion shed."

"The what?" said Ole Doc.

"For the lions," said O'Hara. "We find that carefully selected and properly evoluted Earth lions kill catbeasts and several other kinds of vermin. I've got the deserts to the south of here crawling with lions and some day we'll be rid of catbeasts."

"And then you'll have lions," said Ole Doc.

"Oh no," said O'Hara impatiently. "Then we'll bacteriacide the lions with a plague. Which is to say I will. There isn't any *we*. I've been here for fifteen years—"

"Well, maybe you've been here for fifteen years," said Ole Doc without much sympathy, "but why am *I* here?"

"Oh. It's the last cargo. They send my stuff up here in tramps. Unreliable freight. Last year a tramp came in with a cargo for me and she had some kind of director trouble and had to jettison all her freight. Well, I didn't have any stevedores and they just left it in the rain and the labels came off a lot of the boxes—"

"Ah!" said Ole Doc. "You want me to reclassify sperm—"

"No, no, no!" said O'Hara. "Some of these cargoes were intended for some other experimental station I am sure. But I have no lading bills for the stuff. I don't know. And I'm frantic! I—"

"Well come down to it," said Ole Doc. "WHAT is your problem?"

Dramatically O'Hara approached the first vat and gave the cover a yank. The pulleys creaked. Lights went on and the glass bowls within glowed.

In this one vat there were five human babies.

Ole Doc pushed the cover up further and looked. These babies were near the end of their gestation period and were, in other words, about ready to be born. They seemed to be all complete, hair, fingernails, with the proper number of fingers and

toes and they were obviously very comfortable.

"Well?" said Ole Doc, looking down the endless rows of vats.

"All of them," said O'Hara weakly.

"And they number—?" said Ole Doc.

"About eighteen thousand," said O'Hara.

"Well, if THIS is your problem," said Ole Doc, "I would suggest a hurry-up to the Department of Agriculture back on Earth. You need, evidently, half an army corps of nurses. But as for the problem of getting these babies—"

"Oh, that isn't it!" said O'Hara. "You see, it's these condemned Achnoids. "They're so confounded routine in everything they do. And I guess maybe its my fault, too, because there are so many details on this station that if one Earthman had to listen to them all and arrange them every day he would go crazy. So I guess I'm pretty humpy with them—the ambulating pinwheels! Well, this is the lion shed. We turn out eighteen thousand lions every three months, that being our charted gestation period. Then they go into the pits where they are fed by a facsimile lionness udder and finally they are booted out into the wilderness to go mop up catbeasts. All that is very simple. But these Achnoids—"

"When did you learn about this?"

"Oh, almost six months ago. But I wasn't terribly bothered. Not right then. I just sent a routine report through to Earth. But these Achnoids go right on with routine work unless something stops them. And the labels were all mixed up on that jettison shipment and they picked up phials marked with *our* code number for lions and dumped them into these vats. That's their routine work in this department. That's the only way we could ship cattle and such things, you see, because I don't think you'd like to travel on a cattle spaceship, would you? And it would be expensive, what with the price of freight. And we need lots of stock. So to avoid shipping such things as these lions—"

"I'd think it was to be avoided," said Ole Doc wryly.

"—we've developed a very highly specialized system of handling and marking. And evidently *our* codes aren't identical with the codes at the intended destination of these babies. There's an awful lot of paper work comes off Earth about this sort of thing and frankly I didn't even know they were shipping babies by this system. I went back through all my reports but I must have misfiled something because there isn't anything on it which I've received. Well—"

"You said you messaged the department," said Ole Doc.

"Oh, heck. You know government like it is these days. Earth has three billion inhabitants and one and three quarters billion are working for the government and they still can't keep up with the administration of colonies and stations in space."

"One billion," corrected Ole Doc.

"Well, one billion. And they still can't get our work out. So they just said that the matter had been referred through the proper channels. Then I sent them a couple urgents and they still said it was being referred to proper channels. Maybe they forgot to dig those channels. Well anyway, that isn't what I'm getting at. By some means or other I may be able to devise ways of raising up these infants. I've got three thousand Achnoids and I can always take a hunting rifle and go grab a chief hostage until I get two or three thousand more. They train quick. I haven't got any nurses and none in sight and I have no doctors and what I know about infant maladies is zero. But six months ago I figured I could pull through."

"And now you don't?" said Ole Doc.

"Now I don't. Now this whole thing has got me. I may be indulging in mass murder or something. Will they hang me if any of these kids die or something?"

"Well, I expect that a small loss would be excusable," said Ole Doc.

"Yes, but you see I didn't pay any attention to these Achnoids. And now I think there's the devil to pay. You see, all the fluids used and the strengths used and all were for lions. And that has radically altered things. At least *something* has. I thought that just a couple had got here by mistake and I didn't know how and I got them born all right. But three days ago when I sent that emerg two things had happened. I found this whole shed full of babies and I found that they were all set to be born. And they have gestated only three months!"

"Hm-m-m," said Ole Doc, getting faintly interested. "Well, I see what you're excited about. A three months' gestation on lion fluid would be liable to upset anyone I suppose. So—"

"Wait!" said the wild-eyed O'Hara. "That isn't the problem. I haven't showed you the problem yet!"

"Not yet!" Ole Doc blinked in astonishment.

O'Hara led them rapidly out of the shed and into a big concrete compound. There was a trapdoor in one concrete wall at the far end. O'Hara closed the gate behind them and got them into an observer's box.

"This is where I test the fighting qualities of lions," he said. "I go get a catbeast and turn him loose in here and I let a young lion in on him. It's a control test on the batch. I pick a lion at random by number and let him in. Mookah! Hey there. Mookah! Let go one catbeast!"

An Achnoid pinwheeled into view, cast respectful eyes at the observer's box and began to take the pins out of a door. There were eight pins and he removed them all at once, one hand to a pin.

"Monstrosity," sniffed Hippocrates.

The Achnoid went sailing to safe-

ty over the wall and the cage door crashed open with a bang. Out of it stalked a beast with a purple hide and enormous, sharp-fanged jaws. It bounded into the arena, reared up on its hind legs to stand ten feet tall, waltzed furiously as it looked around for enemies and then settled back with a vicious, tail-lashing snarl.

"Pleasant character," said Ole Doc.

"That's a small one," said O'Hara. "We couldn't capture any large ones if we tried. Lost about fifty Achnoids to them already, I guess. O.K., Mookah! Let her go!"

Mookah wasn't going to be down on the ground for this one. He had a wire attached to the door release which led into a shed. He pulled the wire. And out sauntered a cocky half-pint of a kid, about half the height of Hippocrates but of the physiological structure of a ten-year-old. He was clad in a piece of hide which was belted around his waist and he had a pair of furred buskins on his feet. His hair was wild and long and his eyes were wild and intelligent. Pugnacity was stamped upon him but there was a jauntiness as well. In his hand he carried a sling and on his wrist, hung by a thong, a knife.

"Whoa!" said Ole Doc. "Wait a minute! You're not sacrificing that kid just for my amusement." And he had a blaster up so fast that only a lunge by O'Hara deflected his aim at the catbeast.

The kid looked curiously at the plowed hole the blast had made and then glanced disdainfully at the box. O'Hara, recovered from the lunge hastily pushed a button and got a bulletproof shield in place.

"All right, all right," said Ole Doc. "I'll stand here and watch murder." But he held the blaster ready just in case.

The catbeast had scented the enemy. He got up now and began his waltz, going rapidly forward, his teeth audibly gnashing, his tail kicking up a cloud of dust. On he came. The kid stood where he was, only shifting his sling and putting something into its pocket.

The catbeast was hungry. It began to rave and its sides puffed like bellows. The stench of decayed meat floated up from it as it exhaled its breath in a thundering *aa-um.*

Hippocrates was decidedly interested. He glanced excitedly at Ole Doc and then back at the kid. But that glance had cost Hippocrates the best part of the show.

The kid let the sling spin and go. There was a sickening crunch of pierced and battered bone and the top of the catbeast's head vanished in a fountain of blood and leaping brains.

Down went the catbeast.

The kid walked forward, kicked the still gnashing jaw, grabbed what was left of an ear and hacked it off. He put the ear in his pocket, booted the convulsing catbeast in his expiring guts and turned to face the observation platform. Then, in a flash,

he put a chunk of steel into his sling and whipped it at the glass. The bulletproof shield crawled with cracks and a shower of chips went forward from it.

The kid gave his "pants" a hitch, turned on his heel and strode back into the shed. The door dropped. Mookah dropped into the arena and began to call for help to get the catbeast en route to the cookshack.

"I knew he'd shoot at us," said O'Hara. "The shield was for *him,* not for you, sir."

Ole Doc let out his breath with the realization that he must have been holding it for some time. "Well!"

"Now *that's* my problem," said O'Hara. "There are eighteen thousand of them and they are all males. Sir, what in the name of all that's holy have I done *wrong?*"

"Took a job with the United States Department of Agriculture," said Ole Doc.

"First I was very loving," said O'Hara. "There were only two of them in the lion shed and I thought they'd been overlooked somehow by these condemned Achnoids. I didn't know what had happened. I was puzzled but not really upset. Strange things occur out here on these far stations. So I took them into the house as soon as they were "born" and had a female Achnoid feed them with good cow's milk. And they laid and cooed and I figured out life was a fine thing. And then I was gone on a month's trip to the next continent to see how my plant culture was doing there—planted a million square miles in redwoods—and when I came back I couldn't find the Achnoid nurse and the house was in shreds. So they been out here ever since, confound them. For a while I thought they'd eaten the nurse but she finally came whimpering back home after two weeks lying in the bayonet grass. So here they are. They evidently mature quick."

"Evidently," said Ole Doc.

"Maybe they won't be full grown for several years," said O'Hara. "But every day they get worse. That concrete blockhouse you see down there is just in case."

Ole Doc glanced down to where a dozen Achnoids were slaving in the harsh daylight, building what seemed an impregnable fortress. "Prison?" said Ole Doc.

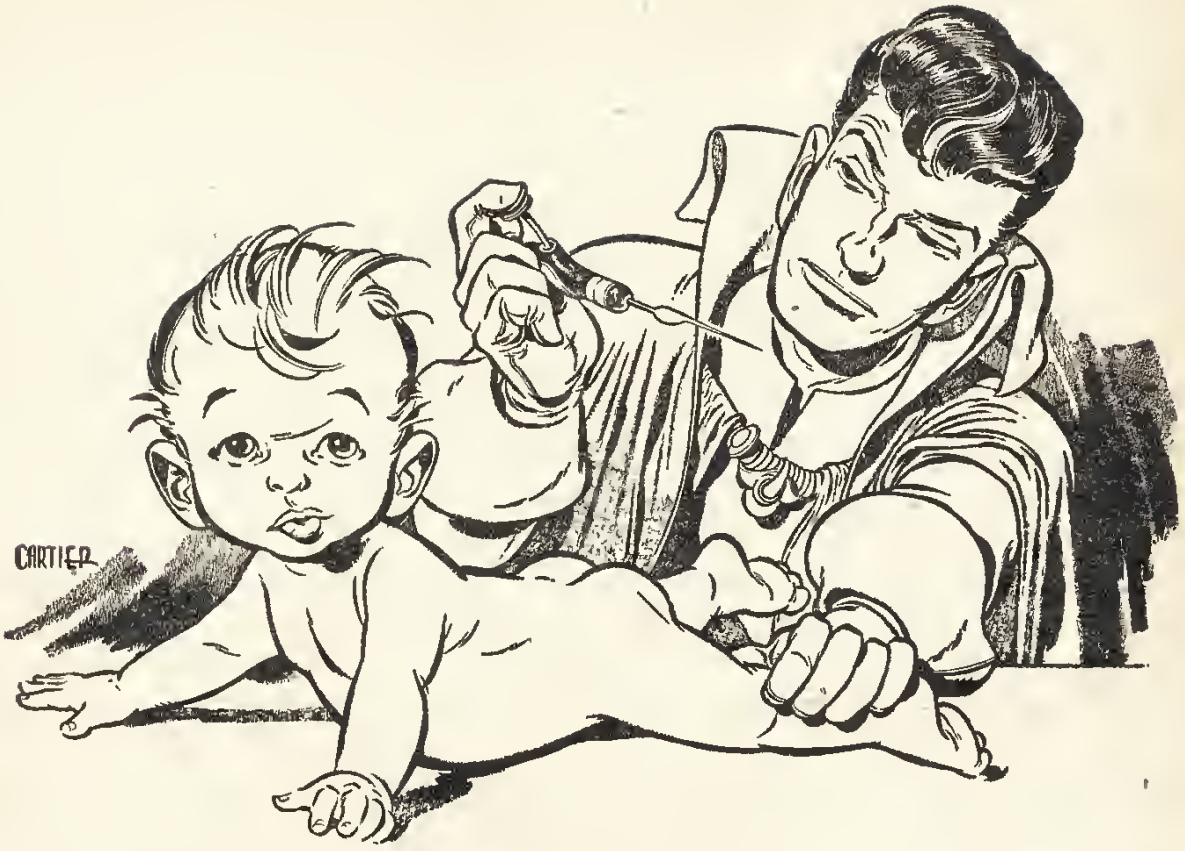
"Refuge!" said O'Hara. "In six months or less this planet won't be safe for Achnoids, catbeasts, scumsnakes, gargantelephants, pluseagles or *me!*"

Ole Doc looked amusedly back at the Achnoids who were carting away the catbeast's body. "Well, you've got one consolation—"

An Achnoid had come up from another shed labeled "Horses" and was giving O'Hara an excited account of something. O'Hara looked pale and near a swoon.

"I said," said Ole Doc, "that you at least have the consolation that it's one generation only. With no females—"

"That's just it," said O'Hara, tot-



tering toward the horse incubation shed.

They went in and found a cluster of Achnoids standing around the first vat. O'Hara thrust them aside and looked and grew even paler. He barked a question and was answered.

"Well?"

"Twenty thousand vats," said O'Hara. "In the third week."

"Babies?" said Ole Doc.

"Females," said OHara, and then more faintly, "Females."

Ole Doc looked around and found Hippocrates. "Saw a couple lakes coming in. With all the other fauna you have on this planet, fishing ought to be interesting."

O'Hara straightened as though he had had an electric shock. "Fishing!"

"Fishing," said Ole Doc. "*You* are the man who is in charge here. I'm just an innocent bystander."

"Now look!" said O'Hara in horror. "You've *got* to help me." He tried to clutch Ole Doc's cape as the Soldier of Light moved away. "You've got to answer some riddles for me! Why is the gestation period three months? Why do they develop in six months to raging beasts! Why are they so antisocial? What have I done wrong in these vats and what can I do to correct it! You've got to help me?"

"I," said Ole Doc, "am going fishing. No doubt to a bacteriologist, a biochemist or a mutologist your

problem would be fascinating. But after all, it's just a problem. I am afraid it is not going to upset the Universe. Good day."

O'Hara stood in trembling disbelief. Here was a Soldier of Light, the very cream of the medical profession, a man who, although he looked thirty was probably near a thousand years old in medical practice of all kinds. Here was a member of the famous Seven Hundred, the Universal Medical Society who had taken the new and dangerous developments out of political hands centuries ago and had made the universe safe for man's dwelling and who patrolled it now. Here he was, right here in O'Hara's sight. Here was succor. Here was the lighthouse, the panacea, the miracle he needed.

He ran beside Ole Doc's rapid striding toward the compound gate. "But sir! It's thirty-eight thousand human beings! It's my professional reputation. I can't kill them. I don't dare turn them loose on this planet! I'll have to desert this station!"

"Desert it then," said Ole Doc. "Open the gate, Hippocrates."

And they left the distracted O'Hara weeping in the dust. "Get my fishing gear," said Ole Doc.

Hippocrates lingered. It was not unlike him to linger when no emergency was in the wind. His antennae felt around in the air and he hefted the 110 mm. with three hands while he scratched his head with the fourth.

"Well?" barked Ole Doc.

Hippocrates looked straight at him. He was somewhat of a space lawyer, Hippocrates. "Article 726 of Code 2, paragraph 80, third from the top of page 607 of the Law Regulating the Behavior of Members of the Universal Medical Society to wit: 'It shall also be unlawful for the Soldier of Light to desert a medical task of which he has been apprised when it threatens the majority of the human population of any planet.'"

Ole Doc looked at his little slave in some annoyance. "Are you going to get my fishing gear?"

"Well?" said Hippocrates.

Ole Doc glared. "Did I invent the Department of Agriculture? Am I accountable for their mistakes? And are they so poor they can't send their own man relief?"

"Well—" said Hippocrates. "No."

"Then you still expect me to spend a year here nursing babies?"

Hippocrates spun his antennae around thoughtfully and then brightened up. He put down the 110 mm. and there was a blur and a big divot in the mud where he had been. Ole Doc kept walking toward the lake he had seen at the far end of the Savannah and exactly three minutes and eight seconds later by his chronograph, Hippocrates was back beside him with about a thousand pounds of rods, tackle, and lunch carried in two hands and a force umbrella and the 110 mm. carried in another. With his fourth hand he held a book on lures and precautions for strange

planets and from this he was busily absorbing whole pages at a glance.

In this happy holiday mood they came to the lake, dried up a half acre of mud with one blast of the 110, pitched a canopy at the water's edge complete with table and chairs, made a wharf by extending a log over the water and generally got things ready to fish.

Hippocrates mixed a cool drink and baited a hook while Ole Doc took his ease and drank himself into a comfortable frame of mind.

"Wonder what I'll get," said Ole Doc. He made his first cast, disposed himself comfortably on the log to watch the motor lure tow its bait around the surface of the lake.

The huge jungle trees reared over the water and the air was still and hot. The yellow lake glowed like amber under a yellow sky. And they began to catch a strange assortment of the finny tribes.

Hippocrates swatted at the mosquitoes for a while. Their beaks got dented against his hide but they annoyed him with their high whine. Finally he was seized with inspiration—direct from "Camping and Hiking Jaunts on Strange Worlds" —and unfolded the force umbrella. It was no more than a stick with a driver in it but its directional lobes could be changed in intensity and area until they covered half a square mile. It was a handy thing to have in a rainstorm on such planets as Sargo where the drops weigh two pounds. And it was handy here where it pushed, on low intensity, the mosquitoes out from the canopy and put them several hundred yards away where they could *zzzt* in impotent frenzy and thwarted rage. Hippocrates put the stick on full so its beams, leaning against the surrounding trees, would keep it in place, and devoted himself to another book he brought out of his knapsack, "Wild Animals I Wish I Hadn't Known."

And into this quiet and peaceful scene moved a jetbomb at the silent speed of two thousand miles an hour. It came straight down from a silver speck which hung in the saffron sky. It had enough explosive in it to knock a house flat. And it was armed.

Ole Doc had just hooked a popeyed monstrosity, Hippocrates had just reached the place where Daryl van Daryl was being swallowed alive by a ramposaurus on Ranameed, and the bomb hit.

It struck the top of the force screen and detonated. The lobes of the screen cantilevered against the trees and kicked six down so hard their roots stuck quivering in the air. The canopy went flat. The log went into the water and the jug of rumades leaped sideways and smote Hippocrates on the back of the neck.

For an instant neither Hippocrates nor Ole Doc had any idea of what had happened. It might have been a fish or a ramposaurus. But in a moment, from the smell in the air, they knew it was a bomb.

Hippocrates instantly went into Chapter Twenty-one paragraph nine

of "Tales of the Space Pioneers," socked the butt of the 110 mm. into the ground, looked at the silver image in the magnetosight and let drive with two thumbs on the trips.

The whole air over them turned flaming red. Another half dozen trees collapsed from concussion. Ole Doc dragged himself out of the water and looked up through the haze at the target.

"Train right!" he said. "Up six miles. Now left!"

But although they kept firing, the silver speck had picked up enough speed toward the zenith to parallel the sizzling, murderous charges and in a moment Hippocrates, with the sight flashing green for out-of-range, stopped shooting.

Ole Doc looked at the upset rumade. He looked at his rod being towed aimlessly across the lake. He looked at Hippocrates.

"Missed," said Hippocrates brightly.

"Is there a force screen over the *Morgue?*" snapped Ole Doc.

"Certainly, master."

"Well, it probably need reinforcing. Grab up the remains here and be quick about it."

While Ole Doc strode rapidly through the jungle to the old landing field, blasting his way through the creepers with a gun in each hand, Hippocrates hastily bundled the remains and scurried along at his heels.

They entered the corridor through the *Morgue's* force field and came to the side of the ship. "At least she's all right," said Ole Doc.

Hippocrates bounced in and stowed the tattered gear while Ole Doc pulled down the switches on the battle panel. After a few minor accidents he had had a complete band of force fields installed and he turned them all on now.

He went forward to the control room and was, as usual, startled by the dulcet tones of his audio recorder. It never seemed right to him that the *Morgue* should talk soprano but he liked soprano and he'd never had it changed.

"There was a battle cruiser overhead eighteen minutes ago," said the *Morgue* complacently. "It dropped a bomb."

"Are you hurt?" said Ole Doc to the board.

"Oh, it didn't drop a bomb on me. It dropped a bomb on you."

"Dimensions and armament?"

"It isn't friendly," said the *Morgue.* "I recorded no data on it except hostility. Advice."

"O.K. What?"

"Turn on invisio screens and move me into the jungle cover."

Ole Doc threw off the switch. Even his ship was ordering him around these days.

He turned to the remote control battle panel and punched the button marked "Invisible" and a moment later a series of light-baffling planes, acting as reflectors for the ground below and so making the *Morgue* disappear from the outside except to detectors, hid them entirely. He

rang "underweigh" so that Hippocrates would have warning to grab something and, without seating himself in the control chair, shot the *Morgue* toward the only hole in the towering jungle trees, a thousand yards from her former location. Lights flashed as the force screen went out and then re-adjusted itself to the natural contour of the landscape and obstacles. Ole Doc dusted his hands. The ship was safe for a moment. Now if that battle cruiser wanted to come low enough to prowl it would get a most frightening surprise. Leaving the fire panel tuned to shoot down anything which did not clip back a friendly recognition signal, Ole Doc moved toward the salon.

But as he passed a port something caught his eye. And it also caught the eye of the alert autoturret on the starboard side. He heard the wheels spinning over his head as the single gun came down to bear on an object in the jungle and he only just made the battle panel to isolate the quadrant from fire.

There was a dead spaceship in there.

Ole Doc checked both blasters and jumped out of the air lock. He went up to his boot tops in muck but floundered ahead toward the grisly thing.

It was crashed and well sunk in the mud and over it had grown a thick coating of slime from which fed countless creepers and vines. It was not only dead. It was being buried by greedy life.

His space boots clung magnetically to the hull as he pushed his way up through the slimy growths and then he was standing at a broken port which stared up at him like an eyeless socket. He stabbed a light into it. What had been an Earthman was tangled amongst the stanchions of a bunk. What had been another was crushed against a bulkhead. Small, furry things scuttled out of these homes as Ole Doc dropped down.

The ship had been there, probably, a year. It had ended its life from heavy explosive and had been skewered through and through by five charges.

Ole Doc burned through a jammed door, going forward to get to the control room. He stumbled over some litters of boxes and his playing light showed up their mildewed lettering:

Department of Agriculture.

Perishable.

Keep under Preservative Rays.

Horses.

Ole Doc frowned and picked his way through this decaying litter. In the control room he found what seepage and bacteria had left of the log. The ship was the *Wanderho* out of Boston, a tramp under charter to the government, delivering perishables, supplies and mail to Department of Agriculture Experimental Stations.

With sudden decision Ole Doc

blew his way out through the bow and walked on logs back to the *Morgue*. He had headed for the only opening he had seen in the jungle wall ahead and that opening had been made by a killed ship.

He came back up through the air lock and opened all the switches on the battle panel except the screens.

"We can go now, master," said Hippocrates brightly. "Scanner shows nothing to stop us."

"Shut that off and fix me a biological kit," said Ole Doc.

"You're not going?" gaped Hippocrates.

"According to article something or other when the majority of a human population on a planet is threatened a soldier has to stay on the job."

"But I said that," said Hippocrates.

"When?" said Ole Doc.

Hippocrates retreated hurriedly into the operating room and began to throw together the hundred and seventy-two items which made up a bacteriological kit and when he had them in cases on his back he shot after Ole Doc who was already a quarter of the way back to the compound.

Ole Doc walked up the steps of O'Hara's bungalow, thrust open the office door and walked in. O'Hara looked up and gaped.

"Why didn't you tell me?" snapped Ole Doc.

"You have an accident with some animal?" said O'Hara. "I heard some shots but I knew you were armed. I thought—"

"About this jettisoned cargo!" said Ole Doc impatiently.

"What about it?" said O'Hara. "They just stacked it up and left."

"You saw them leave?"

"Well, no. The captain was in here telling me he was having trouble with his ship and when I saw they were gone in the morning I went over to see if he'd left our supplies in good shape and I found his cargo. It'd rained and the labels—"

"Was it scattered around?" demanded Ole Doc.

"Why would he scatter it around?" said O'Hara.

"What was the name of that ship?"

"The *Wanderho*," said O'Hara. "Same old tub. The only one which ever comes. Undependable. She's about a month overdue now—"

"O'Hara, you won't ever see that ship again. She's lying over there in the jungle shot full of holes and her crew dead inside. You didn't hear a take-off a year ago. You heard a ship being shot to pieces."

O'Hara looked a little white. "But the cargo! It was all stacked up in a neat pile—"

"Precisely."

"You mean— I don't follow this!"

"Neither do I," said Ole Doc. "Have you got any force screen protection?"

"No? Why should I have? Who'd want to trouble an experimental station? We haven't got *anything*, not even money."

"No screen," said Ole Doc. "Then we may have to work fast. Can you arm these Achnoids?"

"No! And my only weapon is a hunting rifle and a sidearm. I haven't got anything."

"Hippocrates," said Ole Doc, "dismount two turrets and have them set in towers here. They won't do much but they'll stop an attack from land. And, if I'm right, that's all we have to fear."

Hippocrates looked helplessly around for a place to put down the half ton of equipment he was lugging like a mountain above him.

"Just drop it," said Ole Doc. "We're making a lab right here on the porch where it's cool."

O'Hara suddenly flamed brightly. "You mean," he cried in sudden hope, "that you're going to help me? You mean it?"

Ole Doc paid him no attention. He was already fishing in the pile of equipment for a portable ultraelectron microscope and a box of slides. He put them on the table. "Have somebody start bringing me phials out of that preservation room. One sample from every box you've got!"

In the many, many weeks which followed there was no wine, there was only work. And over Ole Doc hung two intelligences which made him very skeptical of his chances of getting out of this one alive. First was the fact that something or somebody had now supercharged the planet's ionosphere thoroughly enough to damp every outgoing and incoming message and as Ole Doc's last reported whereabouts was many a light-year from Gorgon, the chances of any relief were slender to the vanishing point—for a search party would have to look over at least a hundred planets and a nearly infinite cube of sky. Second was the sporadic presence of a silver dot in the sky, the battle cruiser, out of range, unfriendly, waiting. Waiting for what?

"I guess this is a pretty tight spot," grinned Hippocrates, all four arms deep in research assistance. "In 'Tales of the Early Space Pioneers'—"

"Condemn the early space pioneers," said Ole Doc, his eyes aching and his back cricked with weeks of this constant peering. "Give me another phial."

They had made some progress along one line. Ole Doc had taken time off to make sure he could communicate with the "infants terrible" who swarmed now, thirty-eight thousand of them, in the lion and horse pens. He had concocted a series of two thousand slides, based on the methods used for teaching alien intelligences *lingua spacia,* except he was teaching English. Asleep and awake, the horde of precocious "babies" were confronted by projected pictures and dinned with explanation. The projectors had to be very carefully protected and even then blastproof shields had to be renewed every few days when some en-

thusiastic kid bunged a slingshot pebble into it. But they couldn't hurt the screens. Those were simply the concrete walls. So willy-nilly, they learned "horse" and "cow" and "man" and "I am hungry" and "How far is it to the nearest post office?".

It was not safe to approach the pens now unless one wanted a short trip to eternity. But Ole Doc, with a force screen, managed occasional inspections. And on these he was jeered with singsong English, phrases such as, "Go soak your head. Go soak your head. Go soak your head," which, when squalled from a few thousand throats, was apt to give one, if not a soaked head, at least a headache.

On the very first day he had built five gestation vats in the bungalow and had started two females and three males on their way. And all but two of these now born, had been hurriedly taken down to the main herd before they got ideas about mayhem. The remaining pair, a boy and a girl, remained in iron cages on the porch while Hippocrates took notes on their behavior. The notes were not flattering but they were informative.

When two months had passed

after the birth of the experimental five from the vats, the three, properly tagged, in the lion pens and horse pens, had learned to use a small sling. But the two on the porch had not.

Ole Doc's notebook was getting crammed with facts. And now and then he saw a glimmer of knowledge about them. He had ruled out several things, amongst them the unusual radiations which might be present, but weren't, on Gorgon. Next he had crossed off machinery radiation and fluid activity.

And then, on this afternoon, little Hippocrates saw him squint, stand up and thoughtfully snap a slide into small bits.

"Maybe solution?" said Hippocrates and O'Hara in different ways but almost in the same instant.

Ole Doc didn't hear them. He turned to the racks of paraphernalia and began to drag down several bottles which he began to treat with pharmaceutical rayrods.

"You maybe poison the whole batch?" said Hippocrates hopefully.

Ole Doc didn't pay him any heed. He ordered up several flasks and put his weird stew into them and then he drew a sketch.

"Make a catapult like this," said Ole Doc. "One on every corner of the pens. That's eight. With eight flasks, one for each. Trigger them with a magnet against this remote condenser so that when it is pushed, off they go into the compounds."

"And everybody dies?" said Hippocrates expectantly, thoughtful of the bruises he had had wrestling these "babies".

"Rig them up," said Ole Doc. "Because the rest of this is going to take another day or two."

"What's the sudden rush?" said O'Hara.

Ole Doc jerked a thumb at the sky. "They were about a hundred miles lower today."

"They were?" said O'Hara anxiously. "I didn't see them."

"You missed a lot of things," said Ole Doc dryly. And he picked up a bundle of rayrods and began to sort them. He took a look into the yard and saw a chicken contentedly pecking at the dirt.

"Bring me that," he said. "By the way, where's Mookah?"

O'Hara looked around as though expecting the overseer to be right behind him. Then, suddenly, "Say, he hasn't been around for three days. He's supposed to make his report at two o'clock every afternoon and that's an hour ago."

"Uhuh," said Ole Doc.

"Golly, no wonder you guys live so long," said O'Hara. He climbed off the porch and came back with the chicken.

Ole Doc took the bird, pointed a rod at it and the chicken flopped over on its side, dead. Presently it was under a belljar with more rays playing on it. And then before the astonished gaze of O'Hara the

chicken began to change form. The feathers vanished, the shape vanished and within ten minutes there was nothing under the jar but a blob of cellular matter. Ole Doc grunted in satisfaction and tipped the mass into a huge graduate. He stuffed a rayrod into the middle of the mass and left it.

"Another chicken," he said.

O'Hara closed his mouth and ran into the yard to scoop up another one. It squawked and beat its wings until a rayrod was aimed at it. Then, like its relative, it went under the belljar, became jellylike, turned into a translucent mass and got dumped into another graduate.

Five chickens later there were seven graduates full of cells, each with a different kind of rayrod sticking out.

"Now," said Ole Doc, "we take that first baby. The boy."

O'Hara repressed a shudder. He knew that medicine could not make scruples when emergency was present, but there was something about putting a baby, a live, cooing little baby—if a trifle energetic—under a belljar and knocking it into a shapeless nothingness. But at that instant a howl sounded from the pens and O'Hara was happy to assist the now returned Hippocrates in slapping the vigorous infant on the face of the operating table.

O'Hara expected to see the belljar come down and a rayrod go to work. He was somewhat astonished when Ole Doc began to strap the baby to the board and he began to fear that it was going to be a knife job.

But Ole Doc didn't reach for a scalpel. He picked up a big hypo syringe, fitted an antisepticizing needle to it and took two or three cells out of the first graduate. He checked it and then turned to the child.

He made a pass with a glowing button and then plunged the needle into the baby's spine. He withdrew it and made a second pass with the button. Rapidly, in six separate places, he injected cells into the infant anatomy. And then O'Hara's eyes bulged and he went a little sick. For the seventh shot was rammed straight into the child's eye and deep into its brain.

Ole Doc pulled out the needle, made a pass with the button again, and stood back. O'Hara expected a dead baby. After all it had had needles stuck in the back of its head, its spine, its heart and its brain. But the baby cooed and went to sleep.

"Next one," said Ole Doc.

"There isn't going to be a next one," said a cool voice behind them.

They whirled to find a leathery-faced, short-statured character in leather garb who stood indolently leaning against a porch post with an undoubtedly lethal weapon aimed in their general direction.

"And who are you?" said Ole Doc.

"The name is Smalley. Not that you'll be very interested for long. All done playing with the kids?

Well, stand away so you're not in line with those cages and we'll get this over with."

Ole Doc looked at Hippocrates and Hippocrates looked at Ole Doc. It would have taken a very good poker player to have told what passed between them. But Ole Doc knew what he wanted to know. During his chicken treatments his orders had been carried out. He laid his hypo on the table with an histrionic sigh and carelessly thumbed the button on the magnetic release. Very small in the distance there were slight, pinging sounds.

"You know," said Ole Doc, "I wouldn't be too much in a hurry, Smalley."

"And why not?"

"Because I was just giving this kid a treatment to save his life."

"Yeah. I believe you."

"Happens to be the truth," said Ole Doc. "Of course I didn't have any idea that their friends would be along so soon, but I just didn't like to see kids die wholesale. If you'll call up your medico, I'll show him what's to be done—"

"About what?"

"About this illness," said Ole Doc. "Strange thing. Must be a lion disease or something. Very rare. Affects all the nerve centers."

"Those two kids look all right to me!" said Smalley, getting alert and peering at the cages on the porch.

"These I've practically cured, although the girl there still wants her final treatment. But down at the pens—"

"What about the pens?" demanded Smalley.

"There's thirty-eight thousand mighty sick babies. And it's going to take a lot of know-how to heal them. Left untreated, they'll die. But, as you're the one who's interested—"

"Say, how do you know so much?" snarled Smalley.

"I happen to be a doctor," said Ole Doc.

"He is Ole Doc Methuselah!" said Hippocrates with truculence. "He is a Soldier of Light!"

"What's that?" said Smalley.

"A doctor," said Ole Doc. "Now if you'll bring your medico here—"

"And if I don't have one?"

"Why, that's surprising," said Ole Doc. "How do you expect to keep thirty-eight thousand kids whole without a doctor?"

"We'll manage! Now get this, doc. You're going to unbuckle that blaster belt right where you stand and you're going to walk ahead of me slow to the pens. And you'd better be telling the truth."

Ole Doc dropped his belt, made a sign to Hippocrates to gather up the graduates and stepped out toward the pens.

Here, under the slanting yellow rays of the afternoon sun it became very obvious that there wasn't an Achnoid in sight. Instead there were various beings in disordered dress who held carefully ordered

weapons commanding all avenues of escape.

"Thought you'd land tomorrow," said Ole Doc.

"How is that?" snapped Smalley.

"Oh, the way the Achnoids acted. And a detector that's part of my operating kit which said you'd already come down twice before last week to the south of here."

"Just keep walking," said Smalley. "You might get past me but you won't get past the gate or get near your ship. We've had that guarded for two months hoping you'd show up."

"Lucky I didn't, eh?" said Ole Doc. "Your harvest here would be dead."

They stood now near the concrete wall of one pen. Smalley, keeping an eye out behind him and walking with caution, mounted up the ramp. But contrary to Hippocrates' fond expectation, no pellet knocked the top of his head off. He stiffened and stared.

Ole Doc went up beside him and looked down. As far as these pens reached they could see kids lying around, some inert, some twitching, some struggling but all very, very ill. And obvious on the first of them were big red splotches.

Smalley yelled a warning to his guards to stay clear and then faced Ole Doc.

"All right. They're sick. How they goin' to get cured?"

"Why, I was all set to cure them right here," said Ole Doc. "But if you're so anxious to shoot me—"

"That can wait! Cure them! Cure them, you hear me?"

Ole Doc shrugged. "Have it any way you like, Smalley. But I'll need the rest of my equipment over here."

"All right, you'll get it!"

Ole Doc dropped down into the first pen and Hippocrates handed him equipment. From his cloak pocket Ole Doc took a gun hypo which did not need a needle to penetrate. He fitted a charge in this and shot the first kid. Then he rolled the infant over and got to work with his hypo needle.

Smalley looked suspicious. He kept his place at a distance and kept down the visor of his space helmet. Two of his guards came up and, some distance from him, received further orders and went back to watch from the gate.

The first kid got seven shots and then another charge from the hypo gun. The red splotches began to vanish and the child was asleep.

It was assembly line work after that with O'Hara and Hippocrates slinging kids into place and holding them and Hippocrates quadridextrously administering the before and after gun shots.

Night came and they lighted the pens and the work went on. Ole Doc stopped for food after he reached the thousand mark and came back to where Smalley was watching.

"Give me a hand up," said Ole Doc.

Smalley had watched child after child go peacefully to sleep and the blotches vanish and despite his air, he was too confused about Ole Doc not to obey the order. Ole Doc gripped the offered hand and came up over the ramp.

He was nearly back to the bungalow, with one of the guards tagging him when Smalley screamed. Ole Doc went back.

"What's the matter?" he asked solicitously.

"I'm poisoned!" screamed Smalley, sagging down and clawing at his helmet. His face was already turning red, his hands were covered with blotches.

"Well, before you pass out," said Ole Doc, "you'd better tell your guards that I'll have to treat you so they won't think I'm killing you and shoot me out of enthusiasm for their commander."

"Don't shoot him! Don't shoot him whatever he does!" screamed Smalley.

The guards stood well back, eight of them. It made them very nervous when Ole Doc had Hippocrates pass up a hypo gun and a syringe. It made them more nervous when Ole

Doc started to ram Smalley's spine and brain with that long, glittering point.

The first gun cured the blotches, the last gun put Smalley to sleep. And then Ole Doc went on into the bungalow to get himself some food and a little rest.

The following many hours were hectic indeed for it was enough to simply treat thirty-eight thousand kids suffering from skin allergy without the other labors. And to complicate things, members of the hostile ship kept coming down with it, one by one. A scribbled message from Smalley's fourth successor, for instance, finally carried it back to the ship itself. And when the crew tried to bring up the ailing members for treatment, *they* came down.

Shoot with a hypo gun to cure the blotches. Shoot seven times with seven different things in seven different places for each patient. Shoot again to put them into a few hours slumber.

Ole Doc didn't sleep. He kept himself going on multithyroid, which Hippocrates said was very bad for him indeed. But O'Hara keeled over in nervous and physical exhaustion before they had reached the ten thousandth case. They put him under the influence of the second hypo gun and left him in his own lion pen to snooze it off.

And Hippocrates and Ole Doc went on.

It takes a long while to handle thirty-eight thousand babies and one hundred and ten crewmen, much less treat them. But within three days they were done.

Ole Doc stood up and looked at the still snoring acres of babies. And at the rows of sleeping crewmen. And at the five who, nervously aloof, still covered the gate with powerful weapons and barred any escape.

Ole Doc pondered giving them something. But he was too tired to take off. He went into the bungalow and stretched out and soon was sleeping the sleep of the innocent and just.

Eighteen hours later, fully refreshed, he rose and washed his face. He looked out of the window at the vigilant guards and sighed.

"Hippocrates, go gather up our gear."

"We leaving?"

"On the double," said Ole Doc.

With a *swish* and a *swoosh* the little being collected their scattered equipment into a portable pile.

"Now go gather up O'Hara and bring him along," said Ole Doc.

Hippocrates swept off to get the chief of the experimental station and came back lugging him with ease. Then he took up the mountain of heavy equipment in his other two hands and with O'Hara's heels trailing in the dust, tagged after Ole Doc, who walked, buckling on his blasters.

The five at the gate were wary. They had been on the post, in the two enfilading towers, when all the illness began and they weren't going to tolerate anything now. But they

were apprehensive because they could not be sure that their leader and other people would wake up.

"Stop or we shoot!" barked their squad leader.

Ole Doc negligently fingered his first cloak button. It hummed a little. He kept on walking.

"Stop!" cried the squad leader. "Stop and go back until I'm sure they're going to recover or we'll kill you!"

Ole Doc stopped. He looked sadly at the five on the wall above him. And then he suddenly dived to the right and drew in a blur which flamed before it could be seen. He fired rapidly.

Three shots came at him. Three shots ricocheted off his portable force screen. Five guards went down in charred heaps where the ashes lay amid glowing bits of metal.

Ole Doc looked alertly across the Savannah, glanced back to make sure the screen had protected Hippocrates and then struck off for the *Morgue*.

There was no guard there now since that guard had been changed from the ship. Ole Doc swung in, indicated a couch where O'Hara was to be tossed and walked through the vessel to check her for ascent. But she had not been harmed and in a few minutes he could sink with confidence behind his controls and buckle his belts.

He rang for take-off and got Hippocrates' cheery O.K. back. And then the *Morgue* hurtled upwards to an altitude of three miles.

It looked so peaceful down below. The dark green of the jungle bounding the silver of the lakes was pretty to his appreciative eye. And then he dived and put five big, solid charges into the battle cruiser and left her a curling, smoking mass of wreckage. And he dived again at another place to the south and slammed two shots into a mountainous stockpile of structural materials and munitions and saw how prettily their black smoke rose, interspersed red with exploding shells.

That gave him a great deal of satisfaction.

He skipped upwards then through the atmosphere and out into the black comfort of absolute zero and set his course and speed for home.

"Calling Center," he said into his mike. "Calling Center. Methuselah. Methuselah. Calling Center—"

"Come in! Hey! Come in!" said Center, a tenth of a galaxy away.

"Methuselah with a report."

"Methuselah is enough!" said Ole Doc Cautery at Center. "We have had five navies and the marines looking for you for months. We've had six empires scared 'til they can't spit. WHERE have you been?"

"Got a report," said Ole Doc. "Turn this on confidential."

"Circuits on. Begin report."

Ole Doc spoke into the five wave scramble which had defied cryptographers since the UMS had adopted it two hundred years before. "Alien extragalactic race attempted foothold for jump-off attacks on Earth. First independent space flight originators

met so far. Stature about three-quarters Earth normal. Carbon people. Almost a duplicate of man but missing several tissues essential of emotional balance including one brain chord intimately related to kindness, worry and judgment. Established depot of supplies but unable to transport workmen and soldiers in quantity and so made use of Department of Agriculture Experimental Station vats on Gorgan, wrecking freighter and substituting its phials. Very sentient. Obviously well informed intelligence at work in this galaxy. Leaders conditioned to enterprise and spoke English. Detectable by uncommon strength. Life period very short reaching maturity at about six years of age due to emotional imbalances and early development of gonads and so easy to detect in society by rapid aging.

"Treatment and handling of case: Developed the formulae of their gene patterns and isolated missing development cells. Synthesized cells and injected them into proper areas where they will harmonize with bodies. They succumb easily to a strawberry allergy and are painfully affected by it. All beings so located and all artificial gestations infected so that they could be treated. All treated and left in stupor except five who could not be reached with strawberries.

"Recommendations: That you get hold of the Department of Agriculture of the United States as soon as possible and inform them as follows: Their vessel *Wanderho* destroyed. Their station on Gorgon deserted but undamaged; the Achnoids there were bought by the aliens and are no longer to be trusted; inform them that the Gorgon Station is now inhabited by about thirty-eight thousand aliens *converted to human beings* and that a relief expedition should be sent to take care of them since they will none of them be found over twelve years of age and the bulk of them a human five or six months, needing care. Expedition should be armed but should also contain several dozen expert nurses. Gorgon can now be considered to be humanly populated.

"Proceeding at normal speed to base to refit. Please have somebody air out my quarters, preferably Miss Ellison. That is all."

As he threw the switch he heard a gasp behind him. "That's all!" said O'Hara. "You convert thirty-eight thousand one hundred and some odd extragalactic invaders to human beings and you say, 'that's all'! Man, I've heard legends about the Soldiers of Light, but I never realized what superboys you fellows really are."

Ole Doc gave him a very bored look and then and thereafter ignored him.

"Hippocrates," said Ole Doc, "we're almost home. Let's open those last two bottles of wine."

THE END

MAXWELL'S DEMON AND MONSIEUR RANQUE

BY ARTHUR C. PARLETT

This is not a hoax; the article is straight fact. And it's the first time a stream of air's been induced to blow hot and blow cold at the same time!

There was a good deal of talent wasted in the olden days when demons and jinn were imprisoned in quaint bottles, sealed with the signet of Sulayman, and cast into the sea. It has taken hundreds of years, but we at last are on our way to learning how to harness the peculiar powers of such beings. As a starter, we now take the smaller demons, imprison them in T-tubes, seal with the mark of Georges Ranque, and put them to work sorting molecules according to energy content; the hot molecules in one pile and the cold ones in another. Such, at least, was my initial—and erroneous—reaction to the operation of the T-tube whose working drawings are reproduced as Figure No. 1.

This device, shown in assembly as Figure No. 2, effects a separation of a charge of compressed air of uniform temperature into two streams. The current from the longer arm may easily reach a temperature of +200°C., while the temperature of the air stream from the tube at the right may go as low as −50°C. The conditions of the air stream to the T-tube are "normal" temperature, that is 20°C., and pressure of only a few atmospheres. It is interesting

to note that the lowest temperatures are obtained when the ratio of cold air to hot, regulated by means of the valve on the hot end, is approximately 1 :3.

These effects would seem to indicate that the Second Law of Thermodynamics is being successfully violated, and this in turn suggests that the demon proposed by Clerk Maxwell has been found and put to useful work!

The Second Law has often been dressed up in fancy terminology, but all it really says is (1) that water *naturally* flows down hill, not up, and (2) that heat *naturally* flows from hot bodies to cold, not the reverse. In other words, all actions that take place spontaneously tend to bring a system to equilibrium or to rest. As a secondary point, it may be noted that any process starting of and by itself—whether or not it is allowed to proceed to equilibrium—is accompanied by some loss of capacity for self-starting. This loss of capacity for spontaneous change is measured by its gain in entropy, indeed can serve as a basic definition of entropy. It will be noted that no loss of energy is involved; only the degree of availability of the energy to do useful work has been lessened.

A little reflection brings out an interesting corollary to the above: Any action that starts of itself represents a tendency to achieve a state of maximum probability, and the achievement of maximum probability is also the attainment of maximum entropy. When heat flows from a hot body to a colder one; when water flows down hill, both maximum probability and maximum entropy are being attained. Similarly with any other such action you care to name.

It seemed that Monsieur Ranque's device violated this law. Air is certainly a well mixed substance, and the number of molecules in a unit volume is fantastically large. A tremendous aggregation of gaseous molecules in completely random movement simply must arrive at the most probable configuration of complete randomness in short order. Yet the device Monsieur Ranque patented in 1934* apparently effects a separation of hot molecules from cold with consequent *loss* of entropy from the system as a whole. The action is strikingly similar to that of the demon first conceived by Clerk Maxwell.

Clerk Maxwell, remarkable physicist of the last century, recognized the statistical nature of temperature. In a gas of a certain observed temperature, a large percentage of molecules will have a kinetic energy content greatly higher than that corresponding to the thermometer reading, and a large percentage will have a much lower kinetic energy content. The temperature reading is merely the average value. That the same reading is obtained at all points in the system simply means that the

*U. S. Patent No. 1,952,281, assigned March 27, 1934. Method and Apparatus for Obtaining from a Fluid under Pressure two currents of Fluids at Different Temperatures. Inventor: George Joseph Ranque.

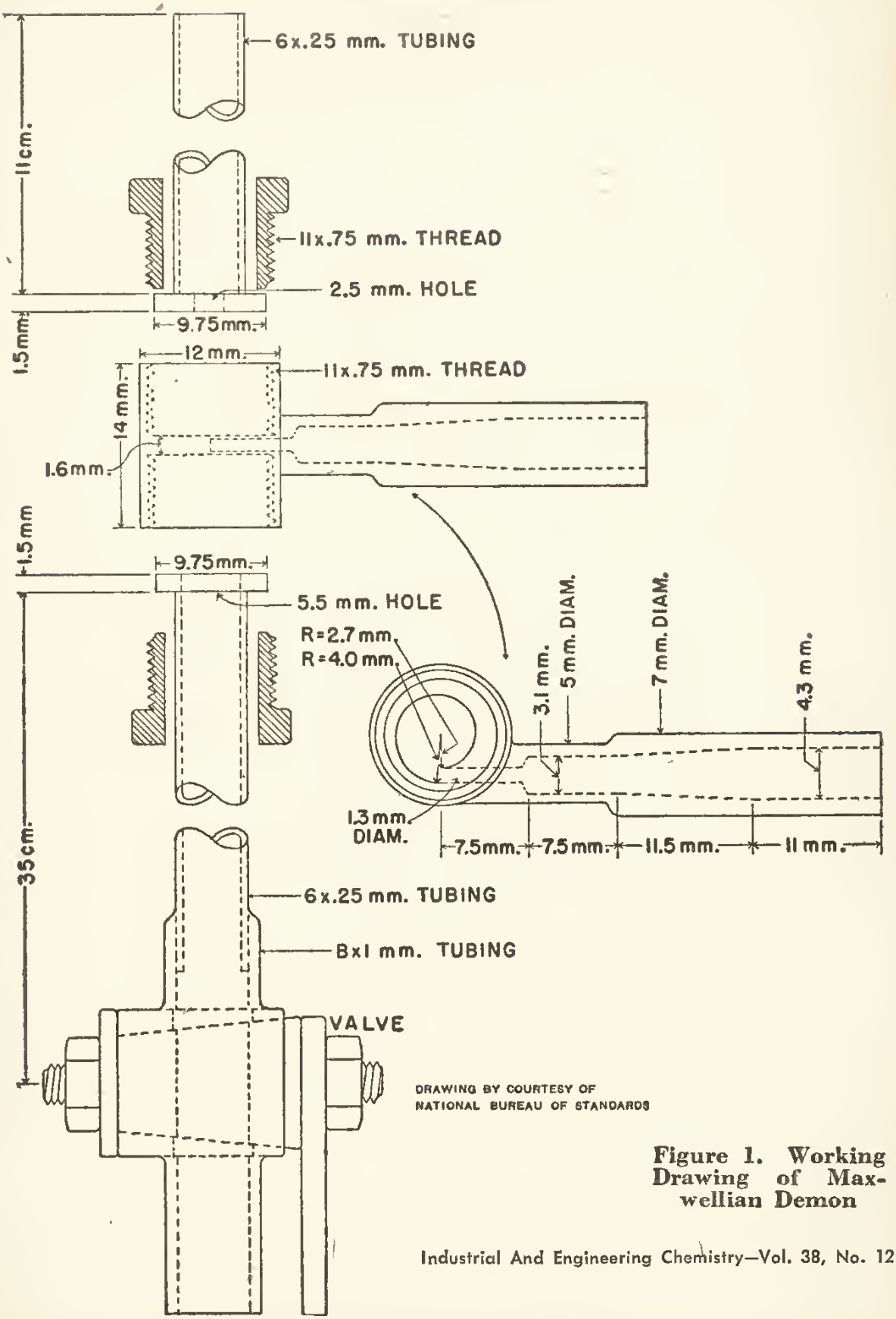


Figure 1. Working Drawing of Maxwellian Demon

system is in its state of maximum probability. The holding of a perfect bridge hand is considered a news item because the number of highly shuffled, random, chaotic arrangements are hundreds of millions of times greater than the perfectly ordered hand. Yet the probabilities in this case are based upon a deck of only fifty-two cards. Because of the unimaginable number of molecules involved, Dodge has said: "Any arrangement in which the hot molecules would predominate to permit an observable difference in temperature between any macroscopic portions of the gas is so improbable as to be nonexistent." (Dodge, B. F. *Chemical Engineering Thermodynamics.*) If only molecules could be dealt with as individuals, thought Maxwell, the laws of probability would no longer apply and the Second Law of Thermodynamics would lose its rigor.

Maxwell conceived of a tiny being, since come to be affectionately known as "Maxwell's demon", who could handle the individual molecules of a gas. He made this demon the guardian of an opening between two boxes containing a gas at uniform conditions of temperature and pressure. The demon was to control the opening by a shutter, and by judicious opening and closing of the shutter he would be able to effect a concentration of hot—high translational energy—molecules in one box and a concentration of cold—low translational energy—molecules in the other, thereby bringing about an appreciable temperature difference between the two, and hence decreasing the entropy of the system.*

For some reason or other, the remarkable nature of George Joseph Ranque's invention seems to have been overlooked in this country for a good many years. It simply lapsed into the Limbo of forgotten things. But in 1946, Dr. R. M. Milton of The Johns Hopkins University visited Germany to investigate low temperature work in connection with superconductivity research. There, in the laboratory of Dr. Rudolf Hilsch, at the Physikalischen Institut, Erlangen, Germany, he found the device in the form illustrated in this article—Ranque in his patent lists a total of fifteen forms the device may take!—where it replaced the usual ammonia pre-cooling apparatus in a liquid air machine. (It is interesting to note that Dr. John R. Roebuck of The University of Wisconsin, writing in the *Journal of Applied Physics, 16,* 285 (1945) had independently presented a fully developed theory for a rotor device to serve the same purpose.) The very considerable experimentation carried out by Dr. Hilsch upon this device, and the publicity attendant to Dr. Milton's announcements has led to the general adoption of the name

*There is a hoary objection that even in this case the law of entropy increase would hold because the increase of entropy within the demon would more than compensate for the decrease in entropy he produced. Lewis and Randall among others, hold that before conceding this point it might be well to know something more of the demon's metabolism.

"Hilsch Tube" for the "Vortex Tube", as it is called by Dr. Hilsch in a recent article.*

The American Chemical Society has very kindly consented to our reproducing the working drawings of the Hilsch tube—Figure No. 1—so that any good machine shop can quite easily construct one for you. When I first saw the tube in operation, I sat with a thermodynamics textbook in my hand for some time. Then I closed it and said wearily to myself, "Well, there goes the Second Law!" For I certainly saw one stream going in and two streams coming out, and one of the outlet streams was cold and the other was hot. And if that weren't effective sorting of molecules according to energy content what was it?

It took quite a while before I realized that the major part of my difficulties arose because the following statements of the Second Law are incomplete; but these partial statements seemed perfectly reasonable to me at the time. More than one politician has found that half-truths make better propaganda than outright falsehood.

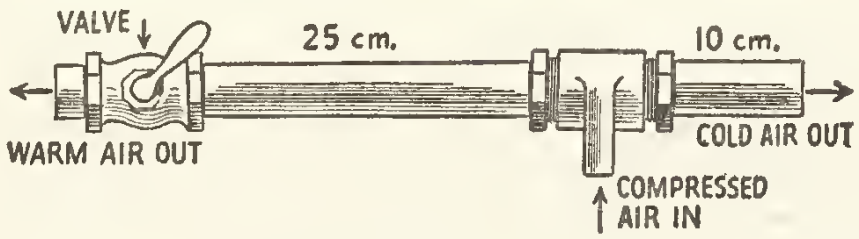
"Water won't flow up hill (two words missing)."
"Heat won't flow from cold bodies to hot (two words missing)."
"A system will not proceed from a more probable state to a less probable state (two words missing)."

In each case the missing two words are the same. They are "WITHOUT COMPENSATION!" In the case of the Hilsch tube, mechanical compensation for the loss of entropy by the gaseous system is provided by the compression and expansion of air. Thermodynamics doesn't give a hoot about mechanism—it is concerned only with the inherent possibilities of a given system.

But it is not even necessary to postulate that there has been a sorting of molecules, and there is much

*Hilsch, R. The Use of the Exponsion of Goses in o Centrifugol Field os Cooling Process. *The Review of Scientific Instruments.* 18, 2, Februory, 1947.

Figure 2.



Maxwell's Demon Lives Here!

experimental evidence to show that this does not occur. There have been quite a few theories of the operation of the "Vortex tube" proposed. The explanation which the author prefers is that of Dr. John R. Roebuck, Physics Department, The University of Wisconsin.

Dr. Roebuck points out* that due to the manner of entry, the air in the top of the T-tube is rotating very rapidly about the axis of the tube. This rotation sets up large centrifugal forces on the air particles outward from the axis, which produce a drop in pressure toward the axis, and a lower pressure at the axis than at the periphery. This is confirmed experimentally, as air will enter at the axial opening instead of escape unless the opening at the bottom of the whirling tube is constricted somewhat. The air coming in at the periphery forces the air in along the radii, and the falling pressure inward on the radius allows this air to expand doing work and cooling the air. It is readily shown that this work adds to the rotating energy of the body of the gas, so speeding it up. Friction with the inner surface of the tube heats up the gas next it. That is, gas drawn off at the axis has been cooled while that drawn off at the periphery near the outer wall has been warmed. Adiabatic expansion of air from ten atmospheres and room temperature to one atmosphere will cool the air by about 135°C., so there is plenty of available cooling.*

And thus the charming picture of the busy little demon sitting inside the tube with a tennis racquet in his hand, batting the molecules to right and to left as they come in, saying to himself, "There's a hot one, smack it to the right! There's a cold one, smack it to the left!" is very effectively demolished, and the Second Law continues to hold true without known exception.

———

*Persanal communicatian to the authar.

*Incidentally, Dr. Hilsch concludes his article previausly referred ta with the abservatian that ". . . . There is little prabability that vartex tubes will replace the customary refrigeroting machines since their efficiencies ore much better in the region of small pressure ratios. There moy, hawever, be special cases where a vartex tube wauld be mare desiroble becouse af simple construction (e.g., air cooling in mine shofts)."

THE END

. . . AND NOW YOU DON'T

BY ISAAC ASIMOV

Conclusion. *For stability, the Foundation had to find and extirpate the Second Foundation. For success, the Second Foundation had to let them! And for survival, the Second Foundation couldn't permit it, of course!*

Illustrated by Rogers

Two "Foundations", established during the dying days of the First Galactic Empire, divide the Universe. The First Foundation, existing at the extreme end of the Galaxy has grown from a tiny world, dedicated to keeping alive the flame of human knowledge during the crash of Empire and regression to barbarism, has had its vicissitudes, grown to power, been temporarily conquered by a mental mutant known as "The Mule" and is now once more powerful and unchallenged.

Except for the Second Foundation. It is the stronghold of mental *science in the Galaxy, and the guardian of Hari Seldon's "Plan", which is the scheme of history, predicted by the greatest psychologist of the old Empire through his mathematized development of the sciences of sociology and economics to the point where statistical predictions could be made. The "Plan" foresees the rebirth of a new Empire through the science of the First Foundation to be led by the mental supermen of the Second Foundation.*

But there are some men in the First Foundation who don't like the thought of being "led" by those of the Second. They feel themselves to be puppets and life to be a mockery unless they can destroy the mentalists and once again be masters of their own fate.

The Second Foundation, on the other hand, realizes that it must avoid being located by the men of the First. So far, through the centuries, the Second Foundation has existed in safety largely because of the fact that no man else knew their location except for that one vague hint that it was at the "other end of the Galaxy".

Dr. Toran Darell is one of the First Foundationers who are trying to locate the Second. Aiding him is the young Pelleas Anthor. Both are encephalographic analysts whose researches into brain wave data,

have convinced them that some of the best men on the First Foundation have been mentally "tampered with" by the mentalists of the Second Foundation. As a move towards locating the enemy, Dr. Darell sends another colleague, Homir Munn, to Kalgan—a nearby world which had once been the capital of the only conqueror the First Foundation had ever experienced, the Mule. The Mule himself had once searched for the Second Foundation, unsuccessfully, and it was thought that among his records, important evidence might be hidden.

Along with Munn, as stowaway, goes Arcadia Darell, Dr. Darell's fourteen-year-old daughter, an active romantic, and precocious girl, who has overheard the discussions of the conspirators and has stowed away on Munn's ship. Together they land on Kalgan.

Kalgan is under the domination of Lord Stettin, so-called First Citizen of the Galaxy and Successor to the Mule, who has gained his position through a coup d'etat *some months earlier, and who dreams of restoring the Mule's Empire by reconquering the First Foundation.*

He allows Munn a free hand in the latter's investigations, while he prepares for war. Eventually, as he gains confidence, he places Homir under arrest and plans to wait for Arcadia to grow a bit older so that he might marry her and unite his house to one of the famous houses of the Foundation—as a political stroke to complete the union that his military forces are to initiate.

Lady Callia, however, Stettin's fading and weak-minded mistress, naturally disapproves of this last part of the plan, secretly helps her new rival to escape from Kalgan and urges Arcadia desperately to return to the Foundation. But as she does so, Arcadia catches a glimpse of amusement and triumph in Callia's eyes which are completely out of character.

Arcadia realizes instantly that Callia is actually a member of the Second Foundation, and knows that she must seek safety. She dares not return to the First Foundation since that is where Callia sends her and which, therefore, obviously hides a trap. Arcadia's dilemma is increased when she discovers that it has become obvious to her where the Second Foundation must *be located. She realizes that she is now the most important person in the Galaxy, and the one least likely to remain long alive.*

That she manages to get away from Kalgan alive is due to the help given her in her panic by Preem Palver and his wife, a good-hearted middle-aged pair of merchants from the agricultural world of Trantor. Trantor had once been the capital of the First Empire, and a gigantic metropolis, but it had long since degenerated to a world of backwoodsmen. Arcadia herself had been born there, at the time when her father had been investigating the old Imperial Library for details as to Sel-

don's Plan and, of course, the location of the Second Foundation.

Preem Palver, asking no further than that Arcadia was a country woman, represented her to be his niece to the soldiers sent by Stettin to locate her, and ended by bribing the officer in charge and thus being allowed to leave. Arcadia cannot feel joy in the escape since she is aware that she is probably only including two kindly people in the inevitable doom.

The news of all this comes back to Dr. Toran Darell via the same officer who had been bribed by Preem Palver and who, it turned out, had been one of Pelleas Anthor's personal agents on Kalgan. Pelleas Anthor, in private, informed his co-worker, Darell, that the Second Foundation was on the trail since brain-wave analysis showed the bribed officer to be one of those "tampered with." The conclusion was that all was known, and that Darell had better follow his daughter to the safety of Trantor.

Darell refuses on the grounds that the Second Foundation deliberately arranged to have Arcadia go to Trantor in the hope that he might follow. Their only chance of survival, he insisted, was to do, and to continue to do, the unexpected.

As they argue, the news arrives that Kalgan has declared war on the First Foundation, and to the stealthy menace of the mentalists is added the pounding ships of the First Citizen of Kalgan.

Part 3

XII.

The mayor of the Foundation brushed futilely at the picket fence of hair that rimmed his skull. He sighed, "The years that we have wasted; the chances we have thrown away. I make no recriminations, Dr. Darell, but we deserve defeat."

Darell said, quietly: "I see no reason for lack of confidence in events, sir."

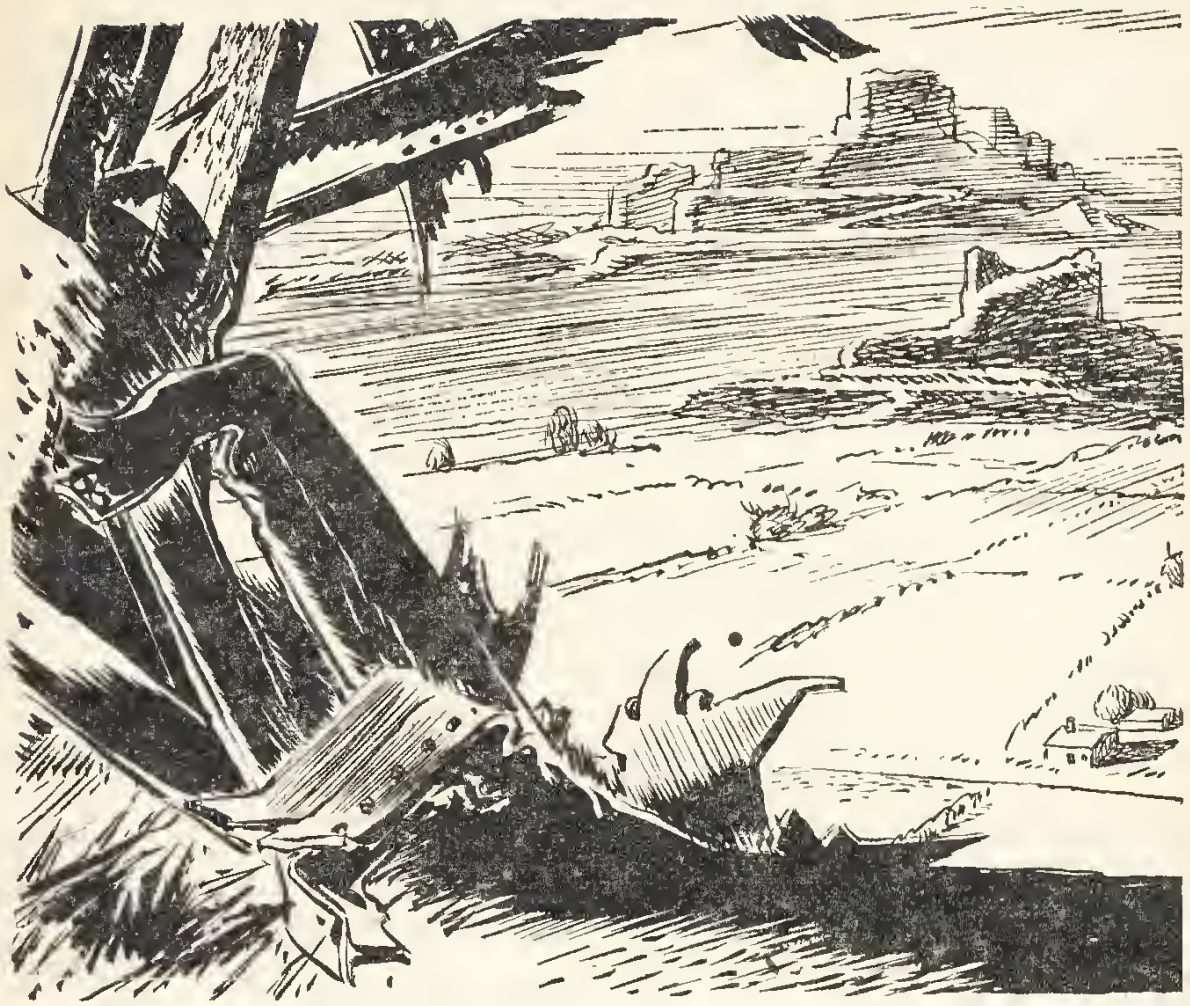
"Lack of confidence! Lack of confidence! By the Galaxy, Dr. Darell, on what would you base any other attitude? Come here—"

He half-led, half-forced Darell toward the limpid ovoid cradled gracefully on its tiny force-field support. At a touch of the mayor's hand, it glowed within—an accurate three-dimensional model of the Galactic double-spiral.

"In yellow," said the mayor, excitedly, "we have that region of Space under Foundation control; in red, that under Kalgan."

What Darell saw was a crimson sphere resting within a stretching yellow fist that surrounded it on all sides but that toward the center of the Galaxy.

"Galactography," said the mayor, "is our greatest enemy. Our admirals make no secret of our almost hopeless, strategic position. Observe. The enemy has inner lines of communication. He is concentrated; can meet us on all sides with equal



ease. He can defend himself with minimum force.

"We are expanded. The average distance between inhabited systems within the Foundation is nearly three times that within Kalgan. To go from Santanni to Locris, for instance, is a voyage of twenty-five hundred parsecs for us, but only eight hundred parsecs for them, if we remain within our respective territories—"

Darell said: "I understand all that, sir."

"And you do not understand that it may mean defeat."

"There is more than distance to war. I say we cannot lose. It is quite impossible."

"And why do you say that?"

"Because of my own interpretation of the Seldon Plan."

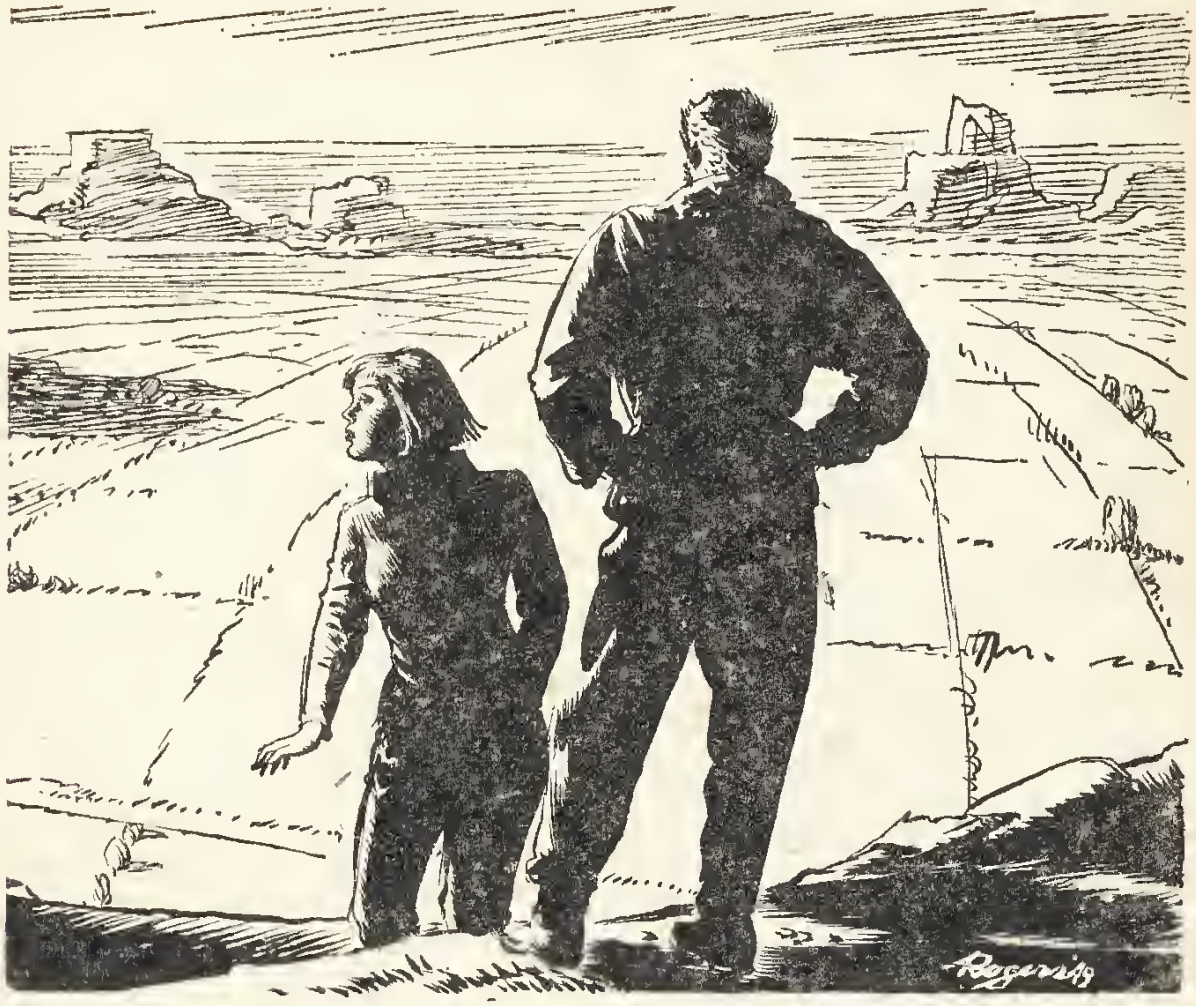
"Oh," the mayor's lips twisted, and the hands behind his back flapped one within the other, "then you rely, too, on the mystical help of the Second Foundation."

"No. Merely on the help of inevitability—and of courage and persistence."

And yet behind his easy confidence, he wondered—

What if—

Well— What if Anthor were



right, and Kalgan were a direct tool of the mental wizards. What if it was their purpose to defeat and destroy the Foundation. No! It made no sense!

And yet—

He smiled bitterly. Always the same. Always that peering and peering through the opaque granite which, to the enemy, was so transparent.

Nor were the galactographic verities of the situation lost upon Stettin.

The Lord of Kalgan stood before a twin of the Galactic model which the mayor and Darell had inspected. Except that where the mayor frowned, Stettin smiled.

His admiral's uniform glistered imposingly upon his massive figure. The crimson sash of the Order of the Mule awarded him by the former First Citizen whom six months later he had replaced somewhat forcefully, spanned his chest diagonally from right shoulder to waist. The Silver Star with Double Comets and Swords sparkled brilliantly upon his left shoulder.

He addressed the six men of his general staff whose uniforms were only less grandiloquent than his own, and his First Minister as well, thin

and gray—a darkling cobweb, lost in the brightness.

Stettin said: "I think the decisions are clear. We can afford to wait. To them, everyday of delay will be another blow at their morale. If they attempt to defend all portions of their realm, they will be spread thin and we can strike through in two simultaneous thrusts here and here." He indicated the directions on the Galactic model—two lances of pure white shooting through the yellow fist from the red ball it inclosed, cutting Terminus off on either side in a tight arc. "In such a manner, we cut their fleet into three parts which can be defeated in detail. If they concentrate, they give up two-thirds of their dominions voluntarily and will probably risk rebellion."

The First Minister's thin voice alone seeped through the hush that followed. "In six months," he said, "the Foundation will grow six months stronger. Their resources are greater, as we all know; their navy is numerically stronger; their manpower is virtually inexhaustible. Perhaps a quick thrust would be safer."

His was easily the least influential voice in the room. Lord Stettin smiled and made a flat gesture with his hand. "The six months—or a year, if necessary—will cost us nothing. The men of the Foundation cannot prepare; they are ideologically incapable of it. It is in their very philospohy to believe that the Second Foundation will save them. But not this time, eh?"

The men in the room stirred uneasily.

"You lack confidence, I believe," said Stettin, frigidly. "Is it necessary once again to describe the reports of our agents in Foundation territory, or to repeat the findings of Mr. Homir Munn, the Foundation agent now in our . . . uh . . . service? Let us adjourn, gentlemen."

Stettin returned to his private chambers with a fixed smile still on his face. He sometimes wondered about this Homir Munn. A queer water-spined fellow who certainly did not bear out his early promise. And yet he crawled with interesting information that carried conviction with it—particularly when Callia was present.

His smile broadened. That fat fool had her uses, after all. At least, she got more with her wheedling out of Munn than he could, and with less trouble. Why not give her to Munn? He frowned. Callia. She and her stupid jealousy. Space! If he still had the Darell girl— Why hadn't he ground her skull to powder for that?

He couldn't quite put his finger on the reason.

Maybe because she got along with Munn. And he needed Munn. It was Munn, for instance, who had demonstrated that, at least in the belief of the Mule, there was no Sec-

ond Foundation. His admirals needed that assurance.

He would have liked to make the proofs public, but it was better to let the Foundation believe in their nonexistent help. Was it actually Callia who had pointed that out? That's right. She had said—

Oh, nonsense! She couldn't have said anything.

And yet—

He shook his head to clear it and passed on.

XIII.

Trantor was a world in dregs and rebirth. Set like a faded jewel in the midst of the bewildering crowd of suns at the center of the Galaxy—in the heaps and clusters of stars piled high with aimless prodigality—it alternately dreamed of past and future.

Time had been when the insubstantial ribbons of control had stretched out from its metal coating to the very edges of stardom. It had been a single city, housing four hundred billion administrators; the mightiest capital that had ever been.

Until the decay of the Empire eventually reached it and in the Great Sack of a century ago, its drooping powers had been bent back upon themselves and broken forever. In the blasting ruin of death, the metal shell that circled the planet wrinkled and crumpled into an aching mock of its own grandeur.

The survivors tore up the metal plating and sold it to other planets for seed and cattle. The soil was uncovered once more and the planet returned to its beginnings. In the spreading areas of primitive agriculture, it forgot its intricate and colossal past.

Or would have but for the still mighty shards that heaped their massive ruins toward the sky in bitter and dignified silence.

Arcadia watched the metal rim of the horizon with a stirring of the heart. The village in which the Palvers lived was but a huddle of houses to her—small and primitive. The fields that surrounded it were golden-yellow, wheat-clogged tracts.

But there, just past the reaching point was the memory of the past, still glowing in unrusted splendor, and burning with fire where the sun of Trantor caught it in gleaming highlights. She had been there once during the months since she had arrived at Trantor. She had climbed onto the smooth, unjointed pavement and ventured into the silent dust-streaked structures, where the light entered through the jags of broken walls and partitions.

It had been solidified heartache. It had been blasphemy.

She had left, clangingly—running until her feet pounded softly on earth once more.

And then she could only look back longingly. She dared not disturb that mighty brooding once more.

Somewhere on this world, she knew, she had been born—near the old Imperial Library, which was the

veriest Trantor of Trantor. It was the sacred of the sacred; the holy of holies! Of all the world, it alone had survived the Great Sack and for a century it had remained complete and untouched; defiant of the universe.

There Hari Seldon and his group had woven their unimaginable web. There Ebling Mis pierced the secret, and sat numbed in his vast surprise, until he was killed to prevent the secret from going further.

There at the Imperial Library, her grandparents had lived for ten years, until the Mule died, and they could return to the reborn Foundation.

There at the Imperial Library, her own father returned with his bride to find the Second Foundation once again, but failed. There, she had been born and there her mother had died.

She would have liked to visit the Library, but Preem Palver shook his round head. "It's thousands of miles, Arkady, and there's so much to do here. Besides, it's not good to bother there. You know; it's a shrine—"

But Arcadia knew that he had no desire to visit the Library; that it was a case of the Mule's Palace over again. There was this superstitious fear on the part of the pygmies of the present for the relics of the giants of the past.

Yet it would have been horrible to feel a grudge against the funny little man for that. She had been on Trantor now for nearly three months and in all that time, he and she—Pappa and Mamma, even she thought of them that way—had been wonderful to her—

And what was her return? Why, to involve them in the common ruin. Had she warned them that she was marked for destruction, perhaps? No! She let them assume the deadly role of protectors.

Her conscience panged unbearably—yet what choice had she?

She stepped reluctantly down the stairs to breakfast. The voices reached her.

Preem Palver had tucked the napkin down his shirt collar with a twist of his plump neck and had reached for his poached eggs with an uninhibited satisfaction.

"I was down in the city yesterday, Mamma," he said, wielding his fork and nearly drowning the words with a capacious mouthful.

"And what is down in the city, Pappa?" asked Mamma indifferently, sitting down, looking sharply about the table, and rising again for the salt.

"Ah, not so good. A ship came in from out Kalgan-way with newspapers from there. It's war there."

"War! So! Well, let them break their heads, if they have no more sense inside. Did your pay check come yet? Pappa, I'm telling you again. You warn old man Cosker that isn't the only co-operative in the world. It's bad enough they pay you what I'm ashamed to tell my friends, but at least on time they could be!"

"Time; shmime," said Pappa, irritably. "Look, don't make me silly talk at breakfast, it should choke me each bite in the throat," and he wreaked havoc among the buttered toast as he said it. He added, somewhat more moderately, "The fighting is between Kalgan and the Foundation, and for two months, they've been at it."

His hands lunged at one another in mock-representation of a space fight.

"Um-m-m. And what's doing?"

"Bad for the Foundation. Well, you saw Kalgan-all soldiers. They were ready. The Foundation was not, and so—*poof!*"

And suddenly, Mamma laid down her fork and hissed, "Fool!"

"Huh?"

"Dumb-head! Your big mouth is always moving and wagging."

She was pointing quickly and when Pappa looked over his shoulder, there was Arcadia, frozen in the doorway.

She said: "The Foundation is at war?"

Pappa looked helplessly at Mamma, then nodded.

"And they're losing?"

Again the nod.

Arcadia felt the unbearable catch in her throat, and slowly approached the table. "Is it over?" she whispered.

"Over?" repeated Pappa, with false heartiness. "Who said it was over? In war, lots of things can happen. And . . . and—"

"Sit down, darling," said Mamma, soothingly. "No one should talk before breakfast. You're not in a healthy condition with no food in the stomach."

But Arcadia ignored her, "Are the Kalganians on Terminus?"

"No," said Pappa, seriously. "The news is from last week, and Terminus is still fighting. This is honest. I'm telling the truth. And the Foundation is still strong. Do you want me to get you the newspapers?"

"Yes!"

She read them over what she could eat of her breakfast and her eyes blurred as she read. Santanni and Korell were gone—without a fight. A squadron of the Foundation's navy had been trapped in the sparsely-sunned Ifni sector and wiped out to almost the last ship.

And now the Foundation was back to the Four-Kingdom core—the original Realm which had been built up under Salvor Hardin, the first mayor. But still it fought—and still there might be a chance—and whatever happened, she must inform her father. She must somehow reach his ear. She *must!*

But how? With a war in the way.

She asked Pappa after breakfast: "Are you going out on a new mission soon, Mr. Palver?"

Pappa was on the large chair on the front lawn, sunning himself. A fat cigar smoldered between his plump fingers and he looked like a beatific pug-dog.

"A mission?" he repeated, lazily.

"Who knows? It's a nice vacation and my leave isn't up. Why talk about new missions? You're restless, Arkady?"

"Me? No, I like it here. You're very good to me, you and Mrs. Palver."

He waved his hand at her, brushing away her words.

Arcadia said: "I was thinking about the war."

"But don't think about it. What can *you* do? If it's something you can't help, why hurt yourself over it?"

"But I was thinking that the Foundation has lost most of its farming worlds. They're probably rationing food there."

Pappa looked uncomfortable, "Don't worry. It'll be all right."

She scarcely listened, "I wish I could carry food to them, that's what. You know after the Mule died, and the Foundation rebelled, Terminus was just about isolated for a time and General Han Pritcher, who succeeded the Mule for a while was laying siege to it. Food was running awfully low and my father says that *his* father told him that they only had dry amino-acid concentrates that tasted terrible. Why, one egg cost two hundred credits. And then they broke the siege just in time and food ships came through from Santanni. It must have been an awful time. Probably it's happening all over, now."

There was pause, and then Arcadia said: "You know, I'll bet the Foundation would be willing to pay smuggler's prices for food now. Double and triple and more. Gee, if any co-operative, f'r instance, here on Trantor took over the job, they might lose some ships, but, I'll bet they'd be war millionaires before it was over. The Foundation Traders in the old days used to do that all the time. There'd be a war, so they'd sell whatever was needed bad and take their chances. Golly, they used to make as much as two million dollars out of one trip—*profit*. That was just out of what they could carry on one ship, too."

Pappa stirred. His cigar had gone out, unnoticed, "A deal for food, huh? Hm-m-m— But the Foundation is so far away."

"Oh, I know. I guess you couldn't do it from here. If you took a regular liner you probably couldn't get closer than Massena or Smushyk, and after that you'd have to hire a small scoutship or something to slip you through the lines."

Pappa's hand brushed at his hair, as he calculated.

Two weeks later, arrangements for the mission were completed. Mamma railed for most of the time—First, at the incurable obstinacy with which he courted suicide. Then, at the incredible obstinacy with which he refused to allow her to accompany him.

Pappa said: "Mamma, why do you act like an old lady. I can't take you. It's man's work. What do you think a war is? Fun? Child's play?"

"Then why do *you* go? Are *you* a man, you old fool—with a leg and half an arm in the grave. Let some of the young ones go—not a fat bald-head like you?"

"I'm not a bald-head," retorted Pappa, with dignity. "I got yet lots of hair. And why should it not be me that gets the commission? Why, a young fellow? Listen, this could mean millions?"

She knew that and she subsided.

Arcadia saw him once before he left.

She said: "Are you going to Terminus?"

"Why not? You say yourself they need bread and rice and potatoes. Well, I'll make a deal with them, and they'll get it."

"Well, then—just one thing: If you're going to Terminus, could you . . . would you see my father?"

And Pappa's face crinkled and seemed to melt into sympathy, "Oh—and I have to wait for you to tell me. Sure, I'll see him. I'll tell him you're safe and everything's O.K., and when the war is over, I'll bring you back."

"Thanks. I'll tell you how to find him. His name is Dr. Toran Darell and he lives in Stanmark. That's just outside Terminus City, and you can get a little commuting plane that goes there. We're at 55 Channel Drive."

"Wait, and I'll write it down."

"No, no," Arcadia's arm shot out. "You mustn't write anything down. You must remember—and find him without anybody's help."

Pappa looked puzzled. Then he shrugged his shoulders, "All right, then. It's 55 Channel Drive in Stanmark, outside Terminus City, and you commute there by plane. All right?"

"One other thing."

"Yes?"

"Would you tell him something from me?"

"Sure."

"I want to whisper it to you."

He leaned his plump cheek toward her, and the little whispered sound passed from one to the other.

Pappa's eyes were round: "That's what you want me to say? But it doesn't make sense."

"He'll know what you mean. Just say I sent it and that I said he would know what it means. And you say it exactly the way I told you. No different. You won't forget it?"

"How can I forget it? Five little words. Look—"

"No, no." She hopped up and down in the intensity of her feelings. "Don't repeat it. Don't ever repeat it to anyone. Forget all about it except to my father. Promise me."

Pappa shrugged again, "I promise! All right!"

"All right," she said, mournfully, and as he passed down the drive to where the air taxi waited to take him to the spaceport, she wondered if she had signed his death warrant. She wondered if she would ever see him again.

She scarcely dared to walk into the house again to face the good, kind Mamma. Maybe when it was

all over, she had better kill herself for what she had done to them.

XIV.

Jole Turbor, in his new role of war correspondent, found his bulk incased in a naval uniform, and rather liked it. He enjoyed being back on the air, and some of the fierce helplessness of the futile fight against the Second Foundation left him in the excitement of another sort of fight with substantial ships and ordinary men.

To be sure, the Foundation's fight had not been remarkable for victories, but it was still possible to be philosophic about the matter. After six months, the hard core of the Foundation was untouched, and the hard core of the Fleet was still in being. With the new additions since the start of the war, it was almost as strong numerically, and stronger technically, than before the defeat at Ifni.

And meanwhile, planetary defenses were being strengthened; the armed forces better trained; administrative efficiency was having some of the water squeezed out of it—and much of the Kalganian's conquering fleet was being wallowed down through the necessity of occupying the "conquered" territory.

At the moment, Turbor was with the Third Fleet in the outer reaches of the Anacreonian sector. In line with his policy of making this a "little man's war," he was interviewing Fennel Leemor, Engineer Third Class, volunteer.

"Tell us a little about yourself, sailor," said Turbor.

"Ain't much to tell," Leemor shuffled his feet and allowed a faint, bashful smile to cover his face, as though he could see all the millions that undoubtedly could see him at the moment. "I'm a Locrian. Got a job in an air-car factory; section head and good pay. I'm married; got two kids, both girls. Say, I couldn't say hello to them, could I—in case they're listening."

"Go ahead, sailor. The video is all yours."

"Gosh, thanks." He burbled, "Hello, Milla, in case you're listening, I'm fine. Is Sunni all right? And Tomma? I think of you all the time and maybe I'll be back on furlough after we get back to port. I got your food parcel but I'm sending it back. We get our regular mess, but they say the civilians are a little tight. I guess that's all."

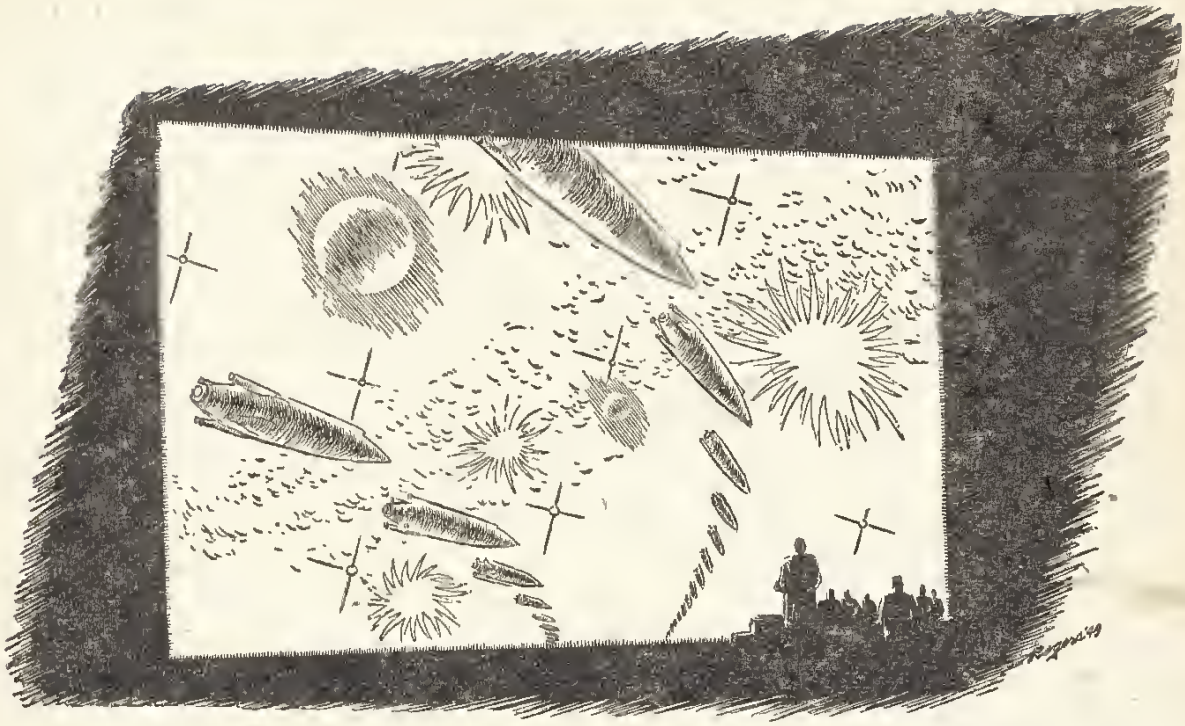
"I'll look her up next time I'm on Locris, sailor, and make sure she's not short of food. O.K.?"

The young man smiled broadly and nodded his head, "Thank you, Mr. Turbor. I'd appreciate that."

"All right. Suppose you tell us, then— You're a volunteer, aren't you?"

"Sure am. If anyone picks a fight with me, I don't have to wait for anyone to drag me in. I joined up the day I heard about the *Hober Mallow.*"

"That's a fine spirit. Have you



seen much action? I notice you're wearing two battle stars."

"Ptah." The sailor spat. "Those weren't battles, they were chases. The Kalganians don't fight, unless they have odds of five to one or better in their favor. Even then they just edge in and try to cut us up ship by ship. Cousin of mine was at Ifni and he was on a ship that got away, the old *Ebling Mis.* He says it was the same there. They had their Main Fleet against just a wing division of ours, and down to where we only had five ships left, they kept stalking instead of fighting. We got twice as many of their ships at *that* fight."

"Then you think we're going to win the war?"

"Sure bet; now that we aren't retreating. Even if things got too bad, that's when I'd expect the Second Foundation to step in. We still got the Seldon Plan—and *they* know it, too."

Turbor's lips curled a bit, "You're counting on the Second Foundation, then?"

The answer came with honest surprise, "Well, doesn't everyone?"

Junior Officer Tippellum stepped into Turbor's room after the visicast. He shoved a cigarette at the correspondent and knocked his cap back to a perilous balance on the occiput.

"We picked up a prisoner," he said.

"Yes?"

"Little crazy fellow. Claims to be a neutral—diplomatic immunity, no less. I don't think they know what to do with him. His name's Palvro, Palver, something like that, and he says he's from Trantor. Don't know

what in space he's doing in a war zone."

But Turbor had swung to a sitting position on his bunk and the nap he had been about to take was forgotten. He remembered quite well his last interview with Darell, the day after war had been declared and he was shoving off.

"Preem Palver," he said. It was a statement.

Tippellum paused and let the smoke trickle out the sides of his mouth. "Yeah," he said, "how in space did you know?"

"Never mind. Can I see him?"

"Space, *I* can't say. The old man has him in his own room for questioning. Everyone figures he's a spy."

"You tell the old man that I know him, if he's who he claims he is. I'll take the responsibility."

Captain Dixyl on the flagship of the Third Fleet watched unremittingly at the Grand Detector. No ship could avoid being a source of subatomic radiation—not even if it were lying an inert mass—and each focal point of such radiation was a little sparkle in the three-dimensional field.

Each one of the Foundation's ships were accounted for and no sparkle was left over, now that the little spy who claimed to be a neutral had been picked up. For a while, that outside ship had created a stir in the captain's quarters. The tactics might have needed changing on short notice. As it was—

"Are you sure you have it?" he asked.

Commander Cenn nodded, "I will take my squadron through hyperspace: radius, 10.00 parsecs; theta, 268.52 degrees; phi, 84.15 degrees. Return to origin at 1330. Total absence 11.83 hours."

"Right. Now we are going to count on pin-point return as regards both space and time. Understand?"

"Yes, captain." He looked at his wrist watch, "My ships will be ready by 0140."

"Good," said Captain Dixyl.

The Kalganian squadron was not within detector range now, but they would be soon. There was independent information to that effect. Without Cenn's squadron they would be badly outnumbered, but the captain was quite confident. *Quite* confident.

Preem Palver looked sadly about him. First at the tall, skinny admiral; then at the others, everyone in uniform; and now at this last one, big and stout, with his collar open and no tie—not like the rest—who said he wanted to speak to him.

Jole Turbor was saying: "I am perfectly aware, admiral, of the serious possibilities involved here, but I tell you that if I can be allowed to speak to him for a few minutes, I may be able to settle the current uncertainty."

"Is there any reason why you can't question him before me?"

Turbor pursed his lips and looked stubborn. "Admiral," he said,

"while I have been attached to your ships, the Third Fleet has received an excellent press. You may station men outside the door, if you like, and you may return in five minutes. But, meanwhile, humor me a bit, and your public relations will not suffer. Do you understand me?"

He did.

Then Turbor in the isolation that followed, turned to Palver, and said: "Quickly—what is the name of the girl you abducted."

And Palver could simply stare round-eyed, and shake his head.

"No nonsense," said Turbor. "If you do not answer, you will be a spy and spies are blasted without trial in war time."

"Arcadia Darell!" gasped Palver.

"Well! All right, then. Is she safe?"

Palver nodded.

"You had better be sure of that, or it won't be well for you."

"She is in good health, perfectly safe," said Palver, palely.

The admiral returned, "Well?"

"The man, sir, is not a spy. You may believe what he tells you. I vouch for him."

"That so?" The admiral frowned, "Then he represents an agricultural co-operative on Trantor that wants to make a trade treaty with Terminus for the delivery of grains and potatoes. Well, all right, but he can't leave now."

"Why not?" asked Palver, quickly.

"Because we're in the middle of a battle. After it is over—assuming we're still alive—we'll take you to Terminus."

The Kalganian fleet that spanged through space detected the Foundation ships from an incredible distance and were themselves detected. Like little fireflies in each other's Grand Detectors, they closed in across the emptiness.

And the Foundation's admiral frowned and said: "This must be their main push. Look at the numbers." Then, "They won't stand up before us, though; not if Cenn's detachment can be counted on."

Commander Cenn had left hours before—at the first detection of the coming enemy. There was no way of altering the plan now. It worked or it didn't, but the admiral felt quite comfortable. As did the officers. As did the men.

Again watch the fireflies.

Like a deadly ballet dance, in precise formations, they sparked.

The Foundation fleet edged slowly backwards. Hours passed and the fleet veered slowly off, teasing the advancing enemy slightly off course, then more so.

In the minds of the dictators of the battle plan, there was a certain volume of space that must be occupied by the Kalganian ships. Out from that volume crept the Foundationers; into it slipped the Kalganians. Those that passed out again were attacked, suddenly and fiercely. Those that stayed within were not touched.

It all depended on the reluctance

of the ships of Lord Stettin to take the initiative themselves—on their willingness to remain where none attacked.

Captain Dixyl stared frigidly at his wrist watch. It was 1310.

"We've got twenty minutes," he said.

The lieutenant at his side nodded tensely, "It looks all right so far, captain. We've got more than ninety percent of them boxed. If we can keep them that way—"

"Yes! *If*—"

The Foundation ships were drifting forward again—very slowly. Not quick enough to urge a Kalganian retreat and just quickly enough to discourage a Kalganian advance. They preferred to wait.

And the minutes passed.

At 1325, the admiral's buzzer sounded in seventy-five ships of the Foundation's line, and they built up to a maximum acceleration towards the front-plane of the Kalganian fleet, itself three hundred strong. Kalganian shields flared into action, and the vast energy beams flicked out. Every one of the three hundred concentrated in the same direction, towards their mad attackers who bore down relentlessly, uncaringly and—

At 1330, fifty ships under Commander Cenn appeared from nowhere, in one single bound through hyperspace to a calculated spot at a calculated time—and were spaced in tearing fury at the unprepared Kalganian rear.

The trap worked perfectly.

The Kalganians still had numbers on their side, but they were in no mood to count. Their first effort was to escape and the formation once broken was only the more vulnerable, as the enemy ships bumbled into one another's path.

After a while, it took on the proportions of a rat hunt.

Of three hundred Kalganian ships, the core and pride of their fleet, some sixty or less, many in a state of near-hopeless disrepair, reached Kalgan once more. The Foundation loss was eight ships out of a total of one hundred twenty-five.

Preem Palver landed on Terminus at the height of the celebration. He found the furore distracting, but before he left the planet, he had accomplished two things, and received one request.

The two things accomplished were: 1) the conclusion of an agreement whereby Palver's co-operative was to deliver twenty shiploads of certain foodstuffs per month for the next year at a war price, without, thanks to the recent battle, a corresponding war risk, and 2) the transfer to Dr. Darell of Arcadia's five short words.

For a startled moment, Darell had stared wide-eyed at him, and then he had made his request. It was to carry an answer back to Arcadia. Palver liked it; it was a simple answer and made sense. It was: "Come back now. There won't be any danger."

XV.

Lord Stettin was in raging frustration. To watch his every weapon break in his hands; to feel the firm fabric of his military might part like the rotten thread it suddenly turned out to be—would have turned Phlegmaticism itself into flowing lava. And yet he was helpless, and knew it.

He hadn't really slept well in weeks. He hadn't shaved in three days. He had canceled all audiences. His admirals were left to themselves and none knew better than the Lord of Kalgan that very little time and no further defeats could elapse before he would have to contend with internal rebellion.

Lev Meirus, First Minister, was no help. He stood there, calm and indecently old, with his thin, nervous finger stroking, as always, the wrinkled line from nose to chin.

"Well," shouted Stettin at him, "contribute something. We stand here defeated, do you understand? *Defeated!* And why? I don't know why. There you have it. I don't know why. Do *you* know why?"

"I think so," said Meirus, calmly.

"Treason!" The word came out softly, and other words followed as softly. "You've known of treason, and you've kept quiet. You served the fool I ejected from the First Citizenship and you think you can serve whatever foul rat replaces me. If you have acted so, I will extract your entrails for it and burn them before your living eyes."

Meirus was unmoved, "I have tried to fill you with my own doubts, not once, but many times. I have dinned it in your ears and you have preferred the advice of others because it stuffed your ego better. Matters have turned out not as I feared, but even worse. If you do not care to listen now, say so, sir, and I shall leave, and, in due course, deal with your successor, whose first act, no doubt, will be to sign a treaty of peace."

Stettin stared at him red-eyed, enormous fists slowly clenching and unclenching, "Speak, you gray slug. *Speak!*"

"I have told you often, sir, that you are not the Mule. You may control ships and guns but you cannot control the minds of your subjects. Are you aware, sir, of who it is you are fighting? You fight the Foundation, which is never defeated—the Foundation, which is protected by the Seldon Plan—the Foundation, which is destined to form new Empire."

"There is no Plan. No longer. Munn has said so."

"Then Munn is wrong. And if he were right, what then? You and I, sir, are not the people. The men and women of Kalgan and its subject worlds believe utterly and deeply in the Seldon Plan as do all the inhabitants of this end of the Galaxy. Nearly four hundred years of history teach the fact that the Foundation cannot be beaten. Neither the kingdoms nor the warlords nor the old Galactic Empire itself could do it."

"The Mule did it."

"Exactly, and he was beyond calculation—and you are not. What is worse, the people know that you are not. So your ships go into battle fearing defeat in some unknown way. The insubstantial fabric of the Plan hangs over them so that they are cautious and look before the attack and wonder a little too much. While on the other side, that same insubstantial fabric fills the enemy with confidence, removes fear, maintains morale in the face of early defeats. Why not? The Foundation has always been defeated at first and has always won in the end.

"And your own morale, sir? You stand everywhere on enemy territory. Your own dominions have not been invaded; are still not in danger of invasion—yet you are defeated. You don't believe in the possibility, even, of victory, because you know there is none.

"Stoop, then, or you will be beaten to your knees. Stoop voluntarily, and you may save a remnant. You have depended on metal and power and they have sustained you as far as they could. You have ignored mind and morale and they have failed you. Now, take my advice. You have the Foundation man, Homir Munn. Release him. Send him back to Terminus and he will carry your peace offers."

Stettin's teeth ground behind his pale, set lips. But what choice had he?

On the first day of the new year, Homir Munn left Kalgan again. More than six months had passed since he had left Terminus and in the interim, a war had raged and faded.

He had come alone, but he left escorted. He had come a simple man of private life; he left the unappointed but nevertheless, actual, ambassador of peace.

And what had most changed was his early concern over the Second Foundation. He laughed at the thought of that; and pictured in luxuriant detail the final revelation to Dr. Darell, to that energetic, young competent, Anthor, to all of them—

He knew. He, Homir Munn, finally knew the truth.

XVI.

The last two months of the Stettinian war did not lag for Homir. In his unusual office as Mediator Extraordinary, he found himself the center of interstellar affairs, a role he could not help but find pleasing.

There were no further major battles—a few accidental skirmishes that could scarcely count—and the terms of the treaty were hammered out with little necessity for concessions on the part of the Foundation. Stettin retained his office, but scarcely anything else. His navy was dismantled; his possessions outside the home system itself made autonomous and allowed to vote for return to previous status, full independence or confederation within the Foundation, as they chose.

The war was formally ended on

an asteroid in Terminus' own stellar system; site of the Foundation's oldest naval base. Lev Meirus signed for Kalgan, and Homir was an interested spectator.

Throughout all that period he did not see Dr. Darell, nor any of the others. But it scarcely mattered. His news would keep—and, as always, he smiled at the thought.

Dr. Darell returned to Terminus some weeks after VK day, and that same evening, his house served as the meeting place for the five men who, ten months eariler, had laid their first plans.

They lingered over dinner and then over wine as though hesitating to return again to the old subject.

It was Jole Turbor, who, peering steadily into the purple depths of the wineglass with one eye, muttered, rather than said: "Well, Homir, you are a man of affairs now, I see. You handled matters well."

"I?" Munn laughed loudly and joyously. For some reason, he had not stuttered in months. "I hadn't a thing to do with it. It was Arcadia. By the by, Darell, how is she? She's coming back from Trantor, I heard?"

"You heard correctly," said Darell, quietly. "Her ship should dock within the week." He looked, with veiled eyes, at the others, but there were only confused, amorphous exclamations of pleasure. Nothing else.

Turbor said: "Then it's over, really. Who would have predicted all this ten months ago. Munn's been to Kalgan and back. Arcadia's been to Kalgan and Trantor and is coming back. We've had a war and won it, by Space. They tell you that the vast sweeps of history can be predicted, but doesn't it seem conceivable that all that has just happened, with its absolute confusion to those of us who lived through it, couldn't possibly have been predicted."

"Nonsense," said Anthor, acidly. "What makes you so triumphant, anyway? You talk as though we have really won a war, when actually we have won nothing but a petty brawl which has served only to distract our minds from the real enemy."

There was an uncomfortable silence, in which only Homir Munn's slight smile struck a discordant note.

And Anthor struck the arm of his chair with a balled and furyfilled fist, "Yes, I refer to the Second Foundation. There is no mention of it and, if I judge correctly, every effort to have no thought of it. Is it because this fallacious atmosphere of victory that palls over this world of idiots is so attractive that you feel you must participate? Turn somersaults then, handspring your way into a wall, pound one another's back and throw confetti out the window. Do whatever you please, only get it out of your system—and when you are quite done and you are yourselves again, return and let us discuss that problem which exists now precisely as it did ten months ago when you sat here with eyes cocked

over your shoulders for fear of you knew not what. Do you really think that the Mind-masters of the Second Foundation are less to be feared because you have beat down a foolish wielder of spaceships."

He paused, red-faced and panting.

Munn said quietly: "Will you hear *me* speak now, Anthor? Or do you prefer to continue your role as ranting conspirator?"

"Have your say, Homir," said Darell, "but let's all of us refrain from over-picturesqueness of language. It's a very good thing in its place, but at present, it bores me."

Homir Munn leaned back in his armchair and carefully refilled his glass from the decanter at his elbow.

"I was sent to Kalgan," he said, "to find out what I could from the records contained in the Mule's Palace. I spent several months doing so. I seek no credit for that accomplishment. As I have indicated, it was Arcadia whose ingenuous intermeddling obtained the entry for me. Nevertheless, the fact remains that to my original knowledge of the Mule's life and times, which, I submit, was not small, I have added the fruits of much labor among primary evidence which has been available to no one else.

"I am, therefore, in a unique position to estimate the true danger of the Second Foundation; much more so than is our excitable friend here."

"And," grated Anthor, "what is your estimate of that danger?"

"Why, zero."

A short pause, and Elvett Semic

asked with an air of surprised disbelief, "You mean zero danger?"

"Certainly. Friends, *there is no Second Foundation!*"

Anthor's eyelids closed slowly and he sat there, face pale and expressionless.

Munn continued, attention-centering and loving it, "And what is more, there was never one."

"On what," asked Darell, "do you base this surprising conclusion?"

"I deny," said Munn, "that it is surprising. You all know the story of the Mule's search for the Second Foundation. But what do you know of the intensity of that search—of the single-mindedness of it. He had tremendous resources at his disposal and he spared none of it. He was single-minded—and yet he failed. No Second Foundation was found."

"One could scarcely expect it to be found," pointed out Turbor, restlessly. "It had means of protecting itself against inquiring minds."

"Even when the mind that is inquiring is the Mule's mutant mentality? I think not. But come, you do not expect me to give you the gist of fifty volumes of reports in five minutes. All of it, by the terms of the peace treaty will be part of the Seldon Historical Museum eventually, and you will all be free to be as leisurely in your analysis as I have been. You will find his conclusion plainly stated, however, and that I have already expressed. There is not, and has never been, any Second Foundation."

Semic interposed, "Well, what stopped the Mule, then?"

"Great Galaxy, what *do* you suppose stopped him? Death did; as it will stop all of us. The greatest superstition of the age is that the Mule was somehow stopped in an all-conquering career by some mysterious entities superior even to himself. It is the result of looking at everything in wrong focus.

"Certainly no one in the Galaxy can help knowing that the Mule was a freak, physical as well as mental. He died in his thirties because his ill-adjusted body could no longer struggle its creaking machinery along. For several years before his death he was an invalid. His best health was never more than an ordinary man's feebleness. All right, then. He conquered the Galaxy and, in the ordinary course of nature, proceeded to die. It's a wonder he proceeded as long and as well as he did. Friends, it's down in the very clearest print. You have only to have patience. You have only to try to look at all facts in new focus."

Darell said, thoughtfully: "Good, let us try that, Munn. It would be an interesting attempt and, if nothing else, would help oil our thoughts. These tampered men—the records of which Anthor brought to us nearly a year ago, what of them? Help us to see them in focus."

"Easily. How old a science is encephalographic analysis? Or, put it another way, how well-developed is the study of neuronic pathways."

"We are at the beginning in this respect. Granted," said Darell.

"Right. How certain can we be then as to the interpretation of what I've heard Anthor and yourself call the Tamper Plateau. You have your theories, but how certain can you be. Certain enough to consider it a firm basis for the existence of a mighty force for which all other evidence is negative? It's always easy to explain the unknown by postulating a superhuman and arbitrary will.

"It's a very human phenomenon. There have been cases all through Galactic history where isolated planetary systems have reverted to savagery, and what have we learned there? In every case, such savages attribute the to-them-incomprehensible forces of Nature—storms, pestilences, droughts—to sentient beings more powerful and more arbitrary than men.

"It is called anthropomorphism, I believe, and in this respect, we are savages and indulge in it. Knowing little of mental science, we blame anything we don't know on supermen—those of the Second Foundation in this case, based on the hint thrown us by Seldon."

"Oh," broke in Anthor, "then you *do* remember Seldon. I thought you had forgotten. Seldon did say there was a Second Foundation. Get *that* in focus."

"And are *you* aware then of all Seldon's purposes. Do you know what necessities were involved in his calculations? The Second Foundation may have been a very necessary scarecrow, with a highly specific end in view. How did we defeat Kalgan, for instance? What were you saying in your last series of articles, Turbor?"

Turbor stirred his bulk, "Yes, I see what you're driving at. I was on Kalgan towards the end, Darell, and it was quite obvious that morale on the planet was incredibly bad. I looked through their news-records and—well, they expected to be beaten. Actually, they were completely unmanned by the thought that eventually the Second Foundation would take a hand, on the side of the First, naturally."

"Quite right," said Munn. "I was there all through the war. I told Stettin there was no Second Foundation and he believed me. *He* felt safe. But there was no way of making the people suddenly disbelieve what they had believed all their lives, so that the myth eventually served a very useful purpose in Seldon's cosmic chess game."

But Anthor's eyes opened, quite suddenly, and fixed themselves sardonically on Munn's countenance: *"I say you lie."*

Homir turned pale, "I don't see that I have to accept, much less answer, an accusation of that nature."

"I say it without any intention of personal offense. You cannot help lying; you don't realize that you are. But you lie just the same."

Semic laid his withered hand on the young man's sleeve, "Take a breath, young fella."

Anthor shook him off, none too

gently, and said: "I'm out of patience with all of you. I haven't seen this man more than half a dozen times in my life, yet I find the change in him unbelievable. The rest of you have known him for years, yet pass it by. It is enough to drive one mad. Do you call this man you've been listening to Homir Munn? He is not the Homir Munn *I* knew."

A medley of shock; above which Munn's voice cried: "You claim me to be an impostor?"

"Perhaps not in the ordinary sense," shouted Anthor above the din, "but an impostor nonetheless. Quiet, everyone! I demand to be heard."

He frowned them ferociously into obedience, "Do any of you remember Homir Munn as I do—the introverted librarian who never talked without obvious embarrassment; the man of tense and nervous voice, who stuttered out his uncertain sentences? Does *this* man sound like him? He's fluent, he's confident, he's full of theories, and, by Space, he doesn't stutter. *Is* he the same person?"

Even Munn looked confused, and Pelleas Anthor drove on, "Well, shall we test him?"

"How?" asked Darell.

"*You* ask how? There is the obvious way. You have his encephalographic record of ten months ago, haven't you? Run one again, and compare."

He pointed at the frowning librarian, and said violently: "I dare him to refuse to subject himself to analysis."

"I don't object," said Munn, defiantly. "I am the man I always was."

"Can *you* know?" said Anthor with contempt. "I'll go further. I trust no one here. I want everyone to undergo analysis. There has been a war. Munn has been on Kalgan; Turbor has been on board ship and all over the war areas. Darell and Semic have been absent, too—I have no idea where. Only I have remained here in seclusion and safety, and I no longer trust any of the rest of you. And to play fair, I'll submit to testing as well. Are we agreed then? Or do I leave now and go my own way?"

Turbor shrugged and said: "I have no objection."

"I have already said I don't," said Munn.

Semic moved a hand in silent assent, and Anthor waited for Darell. Finally, Darell nodded his head.

"Take me first," said Anthor.

The needles traced their delicate way across the cross-hatchings as the young neurologist sat frozen in the reclining seat, with lidded eyes brooding heavily. From the files, Darell removed the folder containing Anthor's old encephalographic record. He showed them to Anthor.

"That's your own signature, isn't it?"

"Yes, yes. It's my record. Make the comparison."

The scanner threw old and new on to the screen. All six curves in each recording were there, and in

the darkness, Munn's voice sounded in harsh clarity. "Well, now, look there. There's a change."

"Those are the primary waves of the frontal lobe. It doesn't mean a thing, Homir. Those additional jags you're pointing to are just anger. It's the others that count."

He touched a control knob and the six pairs melted into one another and co-incided. The deeper amplitude of primaries alone introduced doubling.

"Satisfied?" asked Anthor.

Darell nodded curtly and took the seat himself. Semic followed him and Turbor followed him. Silently the curves were collected; silently they were compared.

Munn was the last to take his seat. For a moment, he hesitated, then, with a touch of desperation in his voice, he said: "Well now, look, I'm coming in last and I'm under tension. I expect due allowance to be made for that."

"There will be," Darell assured him. "No conscious emotion of yours will affect more than the primaries and they are not important."

It might have been hours, in the utter silence that followed—

And then in the darkness of the comparison, Anthor said huskily: "Sure, sure, it's only the onset of a complex. Isn't that what he told us? No such thing as tampering; it's all a silly anthropomorphic notion—but look at it! A coincidence, I suppose."

"What's the matter?" shrieked Munn.

Darell's hand was tight on the librarian's shoulder, "Quiet, Munn—you've been handled; you've been adjusted by *them.*"

Then the light went on, and Munn was looking about him with broken eyes, making a horrible attempt to smile.

"You can't be serious, surely. There is a purpose to this. You're testing me."

But Darell only shook his head. "No, no, Homir. It's true."

The librarian's eyes were filled with tears, suddenly, "I don't feel any different. I can't believe it." With sudden conviction: "You are all in this. It's a conspiracy."

Darell attempted a soothing gesture, and his hand was struck aside. Munn snarled: "You're planning to kill me. By Space, you're planning to kill me."

With a lunge, Anthor was upon him. There was the sharp crack of bone against bone, and Homir was limp and flaccid with that look of fear frozen on his face.

Anthor rose shakily, and said: "We'd better tie and gag him. Later, we can decide what to do." He brushed his long hair back.

Turbor said: "How did you guess there was something wrong with him?"

Anthor turned sardonically upon him, "It wasn't difficult. You see, *I happen to know where the Second Foundation really is.*"

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XVII.

Successive shocks have a decreasing effect—

It was with actual mildness that Semic asked: "Are you sure? I mean we've just gone through this sort of business with Munn—"

"This isn't quite the same," returned Anthor. "Darell, the day the war started, I spoke to you most seriously. I tried to have you leave Terminus. I would have told you then what I will tell you now, if I had been able to trust you."

"You mean you have known the answer for half a year?" smiled Darell.

"I have known it from the time I learned that Arcadia had left for Trantor."

And Darell started to his feet in sudden consternation, "What had Arcadia to do with it? What are you implying?"

"Absolutely nothing that is not plain on the face of all the events we know so well. Arcadia goes to Kalgan and flees in terror to the *very* center of the Galaxy, rather than return home. Lieutenant Dirige, our best agent on Kalgan is tampered with. Homir Munn goes to Kalgan and *he* is tampered with. The Mule conquered the Galaxy, but, queerly enough, he made Kalgan his headquarters, and it occurs to me to wonder if he was conqueror or, perhaps, tool. At every turn, we meet with Kalgan, Kalgan—nothing but Kalgan, the world that somehow survived untouched all the struggles of the warlords for over a century."

"Your conclusion, then."

"Is obvious," Anthor's eyes were intense. "The Second Foundation is on Kalgan."

Turbor interrupted, "I was on Kalgan, Anthor. I was there last week. If there was any Second Foundation on it, I'm mad. Personally, I think you're mad."

The young man whirled on him savagely, "Then you're a fat fool. What do you expect the Second Foundation to be? A grammar school? Do you think that Radiant Fields in tight beams spell out 'Second Foundation' in green and purple along the incoming spaceship routes? Listen to *me,* Turbor. Wherever they are, they form a tight oligarchy. They must be as well hidden on the world on which they exist, as the world itself is in the Galaxy as a whole."

Turbor's jaw muscles writhed: "I don't like your attitude, Anthor."

"That certainly disturbs me," was the sarcastic response. "Take a look about you here on Terminus. We're at the center—the core—the origin of the First Foundation with all its knowledge of physical science. Well, how many of the population are physical scientists? Can *you* operate an Energy Transmitting Station? What do *you* know of the operation of a hyperatomic motor? Eh? The number of real scientists on Terminus—even on Terminus—can be numbered at less than one percent of the population.

"And what then of the Second Foundation where secrecy must be preserved. There will still be less of the cognoscenti, and these will be hidden even from their own world."

"Say," said Semic, carefully. "We just licked Kalgan—"

"So we did. So we did," said Anthor, sardonically. "Oh, we celebrate that victory. The cities are still illuminated; they are still shooting off fireworks; they are still shouting over the televisors. But now, *now,* when the search is on once more for the Second Foundation, where is the last place we'll look; where is the last place anyone will look? Right! Kalgan!

"We haven't hurt them, you know; not really. We've destroyed some ships, killed a few thousands, torn away their Empire, taken over some of their commercial and economic power—but that all means nothing. I'll wager that not one member of the real ruling class of Kalgan is in the least discomfited. On the contrary, they are now safe from curiosity. But not from *my* curiosity. What do you say, Darell?"

Darell shrugged his shoulders, "Interesting. I'm trying to fit it in with a message I received from Arcadia a few months since."

"Oh, a message?" asked Anthor. "And what was it?"

"Well, I'm not certain. Five short words. But it's interesting."

"Look," broke in Semic, with a worried interest, "there's something *I* don't understand."

"What's that?"

Semic chose his words carefully, his old upper lip lifting with each word as if to let them out singly and reluctantly, "Well, now, Homir Munn was saying just a while ago that Hari Seldon was faking when he said that he had established a Second Foundation. Now you're saying that it's not so; that Seldon wasn't faking, eh?"

"Right, he wasn't faking. Seldon said he had established a Second Foundation and so he had."

"All right, then, but he said something else, too. He said he established the two Foundations at opposite ends of the Galaxy. Now, young man, was *that* a fake—because Kalgan isn't at the opposite end of the Galaxy."

Anthor seemed annoyed, "That's a minor point. That part may well have been a cover up to protect them. But after all, think— What real use would it serve to have the Mind-masters at the opposite end of the Galaxy? What is their function? To help preserve the Plan. Who are the main card players of the Plan? We, the First Foundation. Where can they best observe us, then, and serve their own ends? At the opposite end of the Galaxy? Ridiculous! They're within fifty parsecs, actually, which is much more sensible."

"I like that argument," said Darell. "It makes sense. Look here, Munn's been conscious for some time and I propose we loose him. He can't do any harm, really."

Anthor looked rebellious, but

Homir was nodding vigorously. Five seconds later he was rubbing his wrists just as vigorously.

"How do you feel?" asked Darell.

"Rotten," said Munn, sulkily, "but never mind. There's something I want to ask this bright young thing here. I've heard what he's had to say, and I'd just like permission to wonder what we do next."

There was a queer and incongruous silence.

Munn smiled bitterly: "Well, suppose Kalgan *is* the Second Foundation. *Who* on Kalgan are they? How are you going to find them? How are you going to tackle them *if* you find them, eh?"

"Ah," said Darell, "I can answer that, strangely enough. Shall I tell you what Semic and I have been doing this past half-year? It may give you another reason, Anthor, why I was anxious to remain on Terminus all this time."

"In the first place," he went on, "I've been working on encephalographic analysis with more purpose than any of you may suspect. Detecting Second Foundation minds is a little more subtle than simply finding a Tamper Plateau—and I did not actually succeed. But I came close enough.

"Do you know, any of you, how emotional control works? It's been a popular subject with fiction writers since the time of the Mule and much nonsense has been written, spoken, and recorded about it. For the most part, it has been treated as something mysterious and occult. Of course, it isn't. That the brain is the source of a myriad, tiny electromagnetic fields, everyone knows. Every fleeting emotion varies those fields in more or less intricate fashion, and everyone should know that, too.

"Now it is possible to conceive a mind which can sense these changing fields and even resonate with them. That is, a special organ of the cerebrum can exist which can take on whatever field-pattern it may detect. Exactly how it would do this, I have no idea, but that doesn't matter. If I were blind, for instance, I could still learn the significance of photons and energy quanta and it could be reasonable to me that the absorption of a photon of such energy could create chemical changes in some organ of the body such that its presence would be detectable. But, of course, I would not be able, thereby, to understand color.

"Do all of you follow?"

There was a firm nod from Anthor; a doubtful nod from the others.

"Such a hypothetical Mind Resonating Organ, by adjusting itself to the Fields emitted by other minds could perform what is popularly known as 'reading emotion', or even 'reading minds', which is actually something even more subtle. It is but an easy step from that to imagining a similar organ which could actually force an adjustment on another mind. It could orient with its stronger Field the weaker one of another mind—much as a strong

magnet will orient the atomic dipoles in a bar of steel and leave it magnetized thereafter.

"I solved the mathematics of Second Foundationism in the sense that I evolved a function that would predict the necessary combination of neuronic paths that would allow for the formation of an organ such as I have just described—but, unfortunately, the function is too complicated to solve by any of the mathematical tools at present known. That is too bad, because it means that I can never detect a Mind-worker by his encephalographic pattern alone.

"But I could do something else. I could, with Semic's help, construct what I shall describe as a Mental Static device. It is not beyond the ability of modern science to create an energy source that will duplicate an encephalograph-type pattern of electromagnetic field. Moreover, it can be made to shift at complete random, creating, as far as this particular mind-sense is concerned, a sort of 'noise' or 'static' which masks other minds with which it may be in contact.

"Do you still follow?"

Semic chuckled. He had helped create blindly, but he had guessed, and guessed correctly. The old man had a trick or two left—

Anthor said: "I think I do."

"The device," continued Darell, "is a fairly easy one to produce, and I had all the resources of the Foundation under my control as it came under the heading of war research. And now the mayor's offices and

SECOND FOUNDATION

the Legislative assemblies are surrounded with Mental Static. So are most of our key factories. So is this building. Eventually, any place we wish can be made absolutely safe from the Second Foundation or from any future Mule. And that's it."

He ended quite simply with a flat-palmed gesture of the hand.

Turbor seemed stunned, "Then it's all over. Great Seldon, it's all over."

"Well," said Darell, "not exactly."

"How, not exactly? Is there something more?"

"Yes, we haven't located the Second Foundation yet!"

"What," roared Anthor, "are you trying to say—"

"Yes, I am. Kalgan is not the Second Foundation."

"How do *you* know?"

"It's easy," grunted Darell. "You see, *I happen to know where the Second Foundation really is.*"

XVIII.

Turbor laughed suddenly—laughed in huge, windy gusts that bounced ringingly off the walls and died in gasps. He shook his head, weakly, and said: "Great Galaxy, this goes on all night. One after another, we put up our straw men to be knocked down. We have fun, but we don't get anywhere. Space! Maybe all planets are the Second Foundation. Maybe they have no planet, just key men spread on all the planets. And what does it matter, since Darell says we have the perfect defense?"

Darell smiled without humor, "The perfect defense is not enough, Turbor. Even my Mental Static device is only something that keeps us in the same place. We cannot remain forever with our fists doubled, frantically staring in all directions for the unknown enemy. We must know not only *how* to win, but whom to defeat. And there *is* a specific world on which the enemy exists."

"Get to the point," said Anthor, wearily. "What's your information?"

"Arcadia," said Darell, "sent me a message, and until I got it, I never saw the obvious. I probably would never have seen the obvious. Yet it was a simple message that went: 'A circle has no end.' Do you see?"

"No," said Anthor, stubbornly, and he spoke, quite obviously, for the others.

"A circle has no end," repeated Munn, thoughtfully, and his forehead furrowed.

"Well," said Darell, impatiently, "it was clear to me— What is the one absolute fact we know about the Second Foundation, eh? I'll tell you! We know that Hari Seldon located it at the opposite end of the Galaxy. Homir Munn theorized that Seldon lied about the existence of the Foundation. Pelleas Anthor theorized that Seldon had told the truth that far, but lied about the location of the Foundation. But I tell you that Hari Seldon lied in no particular; that he told the absolute truth.

"*But,* what is the other end? The Galaxy is a flat, lens-shaped object. A cross section along the flatness of it is a circle, and a circle has no end—as Arcadia realized. We—*we,* the First Foundation—are located on Terminus at the rim of that circle. We are at an end of the Galaxy, by definition. Now follow the rim of that circle and find the other end. Follow it, follow it, follow it, and you will find no other end. You will merely come back to your starting point—

"And *there* you will find the Second Foundation."

"There?" repeated Anthor. "Do you mean *here?*"

"Yes, I mean here!" cried Darell, energetically. "Why, where else could it possibly be? You said yourself that if the Second Foundationers were the guardians of the Seldon Plan, it was unlikely that they could be located at the so-called other end of the Galaxy, where they would be as isolated as they could conceivably be. You thought that fifty parsecs distance was more sensible. I tell you that that is also too far. That no distance at all is most sensible. And where would they be safest? Who would look for them here? Oh, it's the old principle of the most obvious place being the least suspicious.

"Why was poor Ebling Mis so surprised and unmanned by his discovery of the location of the Second Foundation? There he was, looking for it desperately in order to warn it of the coming of the Mule, only to find that the Mule had already captured both Foundations at a stroke. And why did the Mule himself fail in his search? Why not? If one is searching for an unconquerable menace, one would scarcely look among the enemies already conquered. So the Mind-masters, in their own leisurely time, could lay their plans to stop the Mule, and succeeded in stopping him.

"Oh, it is maddeningly simple. For here *we* are with our plots and our schemes, thinking that we are keeping our secrecy—when all the time we are in the very heart and core of our enemy's stronghold. It's humorous."

Anthor did not remove the skepticism from his face, "You honestly believe this theory, Dr. Darell?"

"I honestly believe it."

"Then any of our neighbors, any man we pass in the street, might be a Second Foundation superman, with his mind watching yours and feeling the pulse of its thoughts."

"Exactly."

"And we have been permitted to proceed all this time, without molestation?"

"Without molestation? Who told you we were not molested? You, yourself, showed that Munn has been tampered with. What makes you think that we sent him to Kalgan in the first place entirely of our own volition—or that Arcadia overheard us and followed him on her own volition? Hah! We have been molested without pause, probably. And

after all, why should they do more than they have? It is far more to their benefit to mislead us, than merely to stop us."

Anthor buried himself in meditation and emerged therefrom with a dissatisfied expression, "Well, then, I don't like it. Your Mental Static isn't worth a thought. We can't stay in the house forever and as soon as we leave, we're lost, with what we now think we know. Unless you can build a little machine for every inhabitant in the Galaxy."

"Yes, but we're not quite helpless, Anthor. These men of the Second Foundation have a special sense which we lack. It is their strength and also their weakness. For instance, is there any weapon of attack that will be effective against a normal, sighted man which is useless against a blind man?"

"Sure," said Munn, promptly. "A light in the eyes."

"Exactly," said Darell. "A good, strong blinding light."

"Well, what of it?" asked Turbor.

"But the analogy is clear. I have a Mind Static device. It sets up an artificial electromagnetic pattern, which to the mind of a man of the Second Foundation would be like a beam of light to us. But the Mind Static device is kaleidoscopic. It shifts quickly and continuously, faster than the receiving mind can follow. All right, then, consider it a flickering light; the kind that would give you a headache, if continued long enough. Now intensify that light or that electromagnetic field until it is blinding—and it will become a pain, an unendurable pain. But only to those with the proper sense; *not* to the unsensed."

"Really?" said Anthor, with the beginnings of enthusiasm. "Have you tried this?"

"On whom? Of course, I haven't tried it. But it will work."

"Well, where do you have the controls for the Field that surrounds the house? I'd like to see this thing."

"Here." Darell reached into his jacket pocket. It was a small thing, scarcely bulging his pocket. He tossed the black, knob-studded cylinder to the other.

Anthor inspected it carefully and shrugged his shoulders, "It doesn't make me any smarter to look at it. Look, Darell, what mustn't I touch? I don't want to turn off the house defense by accident, you know."

"You won't," said Darell, indifferently. "That control is locked in place." He flicked at a toggle switch that didn't move.

"And what's this knob?"

"That one varies rate of shift of pattern. Here—this one varies the intensity. It's that which I've been referring to."

"May I—" asked Anthor, with his finger on the intensity knob. The others were crowding close.

"Why not?" shrugged Darell. "It won't affect us."

Slowly, almost wincingly, Anthor turned the knob, first in one direction, then in another. Turbor was

gritting his teeth, while Munn blinked his eyes rapidly. It was as though they were keening their inadequate sensory equipment to locate this impulse which could not affect them.

Finally, Anthor shrugged and tossed the control box back into Darell's lap, "Well, I suppose we can take your word for it. But it's certainly hard to imagine that anything was happening when I turned the knob."

"But naturally, Pelleas Anthor," said Darell, with a tight smile. "The one I gave you was a dummy. You see I have another." He tossed his jacket aside and seized a duplicate of the control box that Anthor had been investigating, which swung from his belt.

"You see," said Darell, and in one gesture turned the intensity knob to maximum.

And with an unearthly shriek, Pelleas Anthor sank to the floor. He rolled in his agony; whitened, gripping fingers clutching and tearing futilely at his hair.

Munn lifted his feet hastily to prevent contact with the squirming body, and his eyes were twin depths of horror. Semic and Turbor were a pair of plaster casts; stiff and white.

Darell, somber, turned the knob back once more. And Anthor twitched feebly once or twice and lay still. He was alive, his breath racking his body.

"Lift him on to the couch," said Darell, grasping the young man's head. "Help me here."

Turbor reached for the feet. They might have been lifting a sack of flour. Then, after long minutes, the breathing grew quieter, and Anthor's eyelids fluttered and lifted. His face was a horrid yellow; his hair and body was soaked in perspiration, and his voice, when he spoke, was cracked and unrecognizable.

"Don't," he muttered, "Don't! Don't do that again! You don't know— You don't know— Oh-h-h." It was a long, trembling moan.

"We won't do it again," said Darell, "if you will tell us the truth. You are a member of the Second Foundation?"

"Let me have some water," pleaded Anthor.

"Get some, Turbor," said Darell, "and bring the whiskey bottle."

He repeated the question after pouring a jigger of whiskey and two glasses of water into Anthor. Something seemed to relax in the young man—

"Yes," he said, wearily. "I am a member of the Second Foundation."

"Which," continued Darell, "is located on Terminus—here?"

"Yes, yes. You are right in every particular, Dr. Darell."

"Good! Now explain what's been happening this past half year. Tell us!"

"I would like to sleep," whispered Anthor.

"Later! Speak now!"

A tremulous sigh. Then words, low and hurried. The others bent

over him to catch the sound, "The situation was growing dangerous. We knew that Terminus and its physical scientists were becoming interested in brain-wave patterns and that the times were ripe for the development of something like the Mind Static device. And there was growing enmity toward the Second Foundation. We had to stop it without ruining Seldon's Plan.

"We . . . we tried to control the movement. We tried to join it. It would turn suspicion and efforts away from us. We saw to it that Kalgan declared war as a further distraction. That's why I sent Munn to Kalgan. Stettin's supposed mistress was one of us. She saw to it that Munn made the proper moves—"

"Callia is—" cried Munn, but Darell waved him silent.

Anthor continued, unaware of any interruption, "Arcadia followed. We hadn't counted on that—can't foresee everything—so Callia maneuvered her to Trantor to prevent interference. That's all. Except that we lost."

"You tried to get me to go to Trantor, didn't you?" asked Darell.

Anthor nodded, "Had to get you out of the way. The growing triumph in your mind was clear enough. You were solving the problems of the Mind Static device."

"Why didn't you put me under control?"

"Couldn't . . . couldn't. Had my orders. We were working according to a Plan. If I improvised, I would have thrown everything off. Plan only predicts probabilities . . . you know that . . . like Seldon's Plan." He was talking in anguished pants, and almost incoherently. His head twisted from side to side in a restless fever, "We worked with individuals . . . not groups . . . very low probabilities involved . . . lost out. Besides . . . if control you . . . someone else invent device . . . no use . . . had to control *times* . . . more subtle . . . First Speaker's own plan . . . don't know all angles . . . except . . . didn't work a-a-a—" He ran down.

Darell shook him roughly, "You can't sleep yet. How many of you are there?"

"Huh? Whadjasay . . . oh . . . not many . . . be surprised . . . fifty . . . don't need more."

"All here on Terminus?"

"Five . . . six out in Space . . . like Callia . . . got to sleep."

He stirred himself suddenly as though to one giant effort, and his expressions gained in clarity. It was a last attempt at self-justification, at moderating his defeat.

"Almost got you at the end. Would have turned off defenses and seized you. Would have seen who was master. But you gave me dummy controls . . . suspected me all along—"

And finally he was asleep.

Turbor said, in awed tones: "How long did you suspect him, Darell?"

"Ever since he first came here," was the quiet response. "He came

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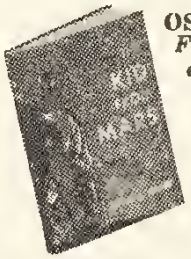

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from Kleise, he said. But I knew Kleise; and I knew on what terms we parted. He was a fanatic on the subject of the Second Foundation and I had deserted him. My own purposes were reasonable, since I thought it best and safest to pursue my own notions by myself. But I couldn't tell Kleise that; and he wouldn't have listened if I had. To him, I was a coward and a traitor, perhaps even an agent of the Second Foundation. He was an unforgiving man and from that time almost to the day of his death he had no dealings with me. Then, suddenly, in his last few weeks of life, he writes me—as an old friend—to greet his best and most promising pupil as a co-worker and begin again the old investigation.

"It was out of character. How could he possibly do such a thing without being under outside influence, and I began to wonder if the only purpose might not be to introduce into my confidence a real agent of the Second Foundation. Well, it was so—"

He sighed and closed his own eyes for a moment.

Semic put in hesitantly: "What will we do with all of them . . . these Second Foundation fellas?"

"I don't know," said Darell, sadly. "We could exile them, I suppose. There's Zoranel, for instance. They can be placed there and the planet saturated with Mind Static. The sexes can be separated, or, better still, they can be sterilized—and in fifty years, the Second Foundation will be a thing of the past. Or perhaps a quiet death for all of them would be kinder."

"Do you suppose," said Turbor, "we could learn the use of this sense of theirs. Or are they born with it, like the Mule."

"I don't know. I think it is developed through long training, since there are indications from encephalography that the potentialities of it are latent in the human mind. But what do you want that sense for? It hasn't helped *them.*"

He frowned.

Though he said nothing, his thoughts were shouting.

It had been too easy—too easy. They had fallen, these invincibles, fallen like book-villains, and he didn't like it.

Galaxy! When can a man know he is not a puppet? *How* can a man know he is not a puppet?

Arcadia was coming home, and his thoughts shuddered away from that which he must face in the end.

She was home for a week, then two, and he could not loose the tight check upon those thoughts. How could he? She had changed from child to young woman in her absence, by some strange alchemy. She was his link to life; his link to a bitter-sweet marriage that scarcely outlasted his honeymoon.

And then, late one evening, he said as casually as he could: "Arcadia, what made you decide that Terminus contained both Foundations?"

They had been to the theater; in the best seats with private trimensional viewers for each; her dress was new for the occasion, and she was happy.

She stared at him for a moment, then tossed it off, "Oh, I don't know, Father. It just came to me."

A layer of ice thickened about Dr. Darell's heart.

"Think," he said, intensely. "This is important. What made you decide both Foundations were on Terminus."

She frowned slightly, "Well, there was Lady Callia. I knew *she* was a Second Foundationer. Anthor said so, too."

"But she was on Kalgan," insisted Darell. *"What made you decide on Terminus?"*

And now Arcadia waited for several minutes before she answered. What *had* made her decide? What had made her decide? She had the horrible sensation of something slipping just beyond her grasp.

She said: "She knew about things —Lady Callia did—and must have had her information from Terminus. Doesn't that sound right, Father?"

But he just shook his head at her.

"Father," she cried, "I *knew*. The more I thought, the surer I was. It just made *sense*."

There was that lost look in her father's eyes, "It's no good, Arcadia. It's no good. Intuition is suspicious when concerned with the Second Foundation. You see that, don't you? It *might* have been intuition—and it might have been control!"

"Control! You mean they changed me? Oh, no. No, they couldn't." She was backing away from him. "But didn't Anthor say I was right? He admitted it. He admitted everything. And you've found the whole bunch right here on Trantor. Didn't you? Didn't you?" She was breathing quickly.

"I know, but— Arcadia, will you let me make an encephalographic analysis of your brain?"

She shook her head violently, "No, no! I'm too scared."

"Of me, Arcadia? There's nothing to be afraid of. But we must know. You see that, don't you?"

She interrupted him only once, after that. She clutched at his arm just before the last switch was thrown. "What if I *am* different, Father? What will you have to do?"

"I don't have to do anything, Arcadia. If you're different, we'll leave. We'll go back to Trantor, you and I, and . . . and we won't care about anything else in the Galaxy."

Never in Darell's life had an analysis proceeded so slowly, cost him so much, and when it was over, Arcadia huddled down and dared not look. Then she heard him laugh and that was information enough. She jumped up and threw herself into his opened arms.

He was babbling wildly as they squeezed one another, "The house is under maximum Mind Static and your brain-waves are normal. We really have trapped them, Arcadia, and we can go back to living."

"Father," she gasped, "can we let them give us medals now?"

"How did you know I'd asked to be left out of it?" He held her at arm's length for a moment, then laughed again. "Never mind; you know everything. All right, you can have your medal on a platform, with speeches."

"And Father?"

"Yes?"

"Can you call me Arkady from now on."

"But— Very well, Arkady."

Slowly the magnitude of the victory was soaking into him and saturating him. The Foundation—the First Foundation—now the only Foundation—was absolute master of the Galaxy. No further barrier stood between themselves and the Second Empire—the final fulfillment of Seldon's Plan.

They had only to reach for it—

Thanks to—

IX.

An unlocated room on an unlocated world!

And a man whose plan had worked.

The First Speaker looked up at the Student, "Fifty men and women," he said. "Fifty martyrs! They knew it meant death or permanent imprisonment and they could not even be oriented to prevent weakening—since orientation might have been detected. Yet they did not weaken. They brought the plan through, because they loved the greater Plan."

"Might they have been fewer?" asked the Student, doubtfully.

The First Speaker slowly shook his head, "It was the lower limit. Less could not possibly have carried conviction. In fact, pure objectivism would have demanded seventy-five to leave margin for error. Never mind. Have you studied the course of action as worked out by the Speakers' Council fifteen years ago?"

"Yes, Speaker."

"And compared it with actual developments?"

"Yes, Speaker." Then, after a pause—

"I was quite amazed, Speaker."

"I know. There is always amazement. If you knew how many men labored for how many months—years, in fact—to bring about the polish of perfection, you would be less amazed. Now tell me what happened—in words. I want your translation of the mathematics."

"Yes, Speaker." The young man marshaled his thoughts. "Essentially, it was necessary for the men of the First Foundation to be thor-

oughly convinced that they had located *and destroyed* the Second Foundation. In that way, there would be reversion to the intended original. To all intents, Terminus would once again know nothing about us; include us in none of their calculations. We are hidden once more, and safe—at the cost of fifty men."

"And the purpose of the Kalganian war?"

"To show the Foundation that they could beat a physical enemy—to wipe out the damage done to their self-esteem and self-assuredness by the Mule."

"There you are insufficient in your analysis. Remember, the population of Terminus regarded us with distinct ambivalence. They hated and envied our supposed superiority; yet they relied on us implicitly for protection. If we had been 'destroyed' before the Kalganian war, it would have meant panic throughout the Foundation. They would then never have had the courage to stand up against Stettin, when he *then* attacked; and he would have. Only in the full flush of victory could the 'destruction' have taken place with minimum ill-effects. Even waiting a year, thereafter,

might have meant a too-great cooling off spirit for success."

The Student nodded, "I see. Then the course of history will procced without deviation in the direction indicated by the Plan."

"Unless," pointed out the First Speaker, "further accidents, unforeseen and individual, occur."

"And for that," said the Student, "*we* still exist. Except— Except— One facet of the present state of affairs worries me, Speaker. The First Foundation is left with the Mind Static device—a powerful weapon against us. That, at least, is not as it was before."

"A good point. But they have no one to use it against. It has become a sterile device; just as without the spur of our own menace against them, encephalographic analysis will become a sterile science. Other varieties of knowledge will once again bring more important and immediate returns. So this first generation of mental scientists among the First Foundation will also be the last—and, in a century, Mind Static will be a nearly forgotten item of the past."

"Well—" The Student was calculating mentally. "I suppose you're right."

"But what I want you most to realize, young man, for the sake of your future in the Council is the consideration given to the tiny intermeshings that were forced into our plan of the last decade and a half simply because we dealt with individuals. There was the manner in which Anthor had to create suspicion against himself in such a way that it would mature at the right time, but that was relatively simple.

"There was the manner in which the atmosphere was so manipulated that to no one on Terminus would it occur, prematurely, that Terminus itself might be the center they were seeking. That knowledge had to be supplied to the young girl, Arcadia, who would be heeded by no one but her own father. She had to be sent to Trantor, thereafter, to make certain that there would be no premature contact with her father. Those two were the two poles of a hyperatomic motor; each being inactive without the other. And the switch had to be thrown—contact had to be made—at just the right moment. I saw to that!

"And the final battle had to be handled properly. The Foundation's fleet had to be soaked in self-confidence, while the fleet of Kalgan made ready to run. I saw to that, also!"

Said the Student: "It seems to me, Speaker, that you . . . I mean, all of us . . . were counting on Dr. Darell not suspecting that Arcadia was our tool. According to *my* check on the calculations, there was something like a thirty percent probability that he *would* so suspect. What would have happened then?"

"We had taken care of that.

What have you been taught about Tamper Plateaus? What are they? Certainly not evidence of the introduction of an emotional bias. That can be done without any chance of possible detection by the most refined conceivable encephalographic analysis. A consequence of Leffert's Theorem, you know. It is the removal, the cuttinng-out, of previous emotional bias, that shows. It *must* show.

"And, of course, Anthor made certain that Darell knew all about Tamper Plateaus.

"However— When can an individual be placed under Control without showing it? Where there is no previous emotional bias to remove. In other words, when the individual is a new-born infant with a blank slate of a mind. Arcadia Darell was such an infant here on Trantor fifteen years ago, when the first line was drawn into the structure of the plan. She will never know that she has been Controlled, and will be all the better for it, since her Control involved the development of a precocious and intelligent personality."

The First Speaker laughed shortly, "In a sense, it is the irony of it all that is most amazing. For four hundred years, so many men have been blinded by Seldon's words 'the other end of the Galaxy.' They have brought their own peculiar, physical-science thought to the problem, measuring off the other end with protractors and rulers, ending up eventually either at a point in the periphery one hundred eighty degrees around the rim of the Galaxy, or back at the original point.

"Yet our very greatest danger lay in the fact that there *was* a possible solution based on physical modes of thought. The Galaxy, you know, is not simply a flat ovoid of any sort; nor is the periphery a closed curve. Actually, it is a double spiral, with at least eighty percent of the inhabited planets on the Main Arm. Terminus is the extreme outer end of the spiral arm, and we are at the other—since, what is the opposite end of a spiral? Why, the center.

"But that is trifling. It is an accidental and irrelevant solution. The solution could have been reached immediately, if the questioners had but remembered that Hari Seldon was a *social* scientist, not a physical scientist and adjusted their thought processes accordingly. What *could* 'opposite ends' mean to a social scientist? Opposite ends on the map? Of course not. That's the mechanical interpretation only.

"The First Foundation was at the periphery, where the original Empire was weakest, where its civilizing influence was least, where its wealth and culture were most nearly absent. And where is the *social* opposite end of the Galaxy? Why, at that place where the original Empire was strongest, where its civilizing influence was most, where its wealth and culture were most strongly present.

"Here! At the center! At Trantor, capital of the Empire of Seldon's time.

"And it is so inevitable. Hari Seldon left the Second Foundation behind him to maintain, improve, and extend his work. That has been known, or guessed at, for fifty years. But where could that best be done? At Trantor, where Seldon's group had worked, and where the data of decades had been accumulated. And it was the purpose of the Second Foundation to protect the Plan against enemies. That, too, was known! And where was the source of greatest danger to Terminus and the Plan?

"Here! Here at Trantor, where the Empire dying though it was, could, for three centuries, still destroy the Foundation, if it could only have decided to do so.

"Then when Trantor fell and was sacked and utterly destroyed, a short century ago, *we* were naturally able to protect our headquarters, and, on all the planet, the Imperial Library and the grounds about it remained untouched. This was well-known to the Galaxy, but even that apparently overwhelming hint passed them by.

"It was here at Trantor that Ebling Mis discovered us; and here that we saw to it that he did not survive the discovery. To do so, it was necessary to arrange to have a normal Foundation girl defeat the tremendous mutant powers of the Mule. Surely, such a phenomenon might have attracted suspicion to the planet on which it happened— It was here that we first studied the Mule and planned his ultimate defeat. It was here that Arcadia was born and the train of events begun that led to the great return to the Seldon Plan.

"And all those flaws in our secrecy; those gaping holes; remained unnoticed because Seldon had spoken of 'the other end' in his way, and they had interpreted it in their way."

The First Speaker had long since stopped speaking to the Student. It was an exposition to himself, really, as he stood before the window, looking up at the incredible blaze of the firmament; at the huge Galaxy that was now safe forever.

"Hari Seldon called Trantor, 'Star's End'," he whispered, "and why not that bit of poetic imagery. All the universe was once guided from this rock; all the apron strings of the stars led here. 'All roads lead to Trantor,' says the old proverb, 'and that is where all stars end.'"

Ten months earlier, the First Speaker had viewed those same crowding stars—nowhere as crowded as at the center of that huge cluster of matter Man calls the Galaxy—with misgivings; but now there was a somber satisfaction on the round and ruddy face of Preem Palver—First Speaker.

THE END

BOOK REVIEW

"The Ship Of Ishtar," by A. Merritt; Memorial Edition, Borden Publishing Co., $3.50.

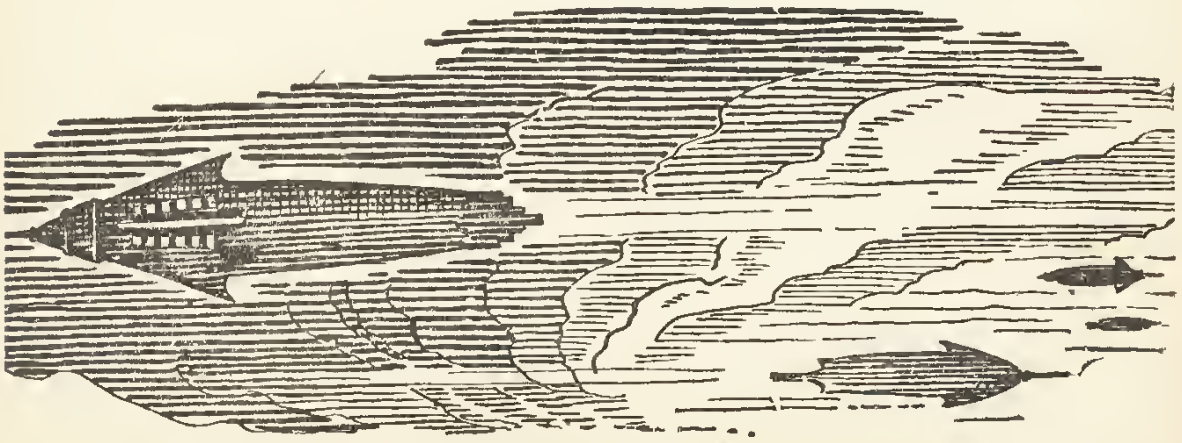
This book is a beauty. The publisher is to be congratulated on a top-flight production job, worthy of the subject. Ace jacket designer Edgard Cirlin has done a honey of a dust-wrapper, which features a by-lined biography of Merritt by Forrest J. Ackerman on the back.

This is the sixth printing of "Ishtar" since its original appearance a quarter of a century ago, and, in its definitive edition, probably the final printing—at least for a long time to come. Not since its first serialization in 1924 has the complete version been offered, and, strangely enough, as it now stands the text of the Memorial Edition is even more satisfactory, certain small errors having been eliminated. The meticulous proofreading job was intrusted to G. Gordon Dewey, compiler of "The Merritt Biblion" and himself so fond of "The Ship of Ishtar" that he named his first-born daughter after the heroine, Sharane. Dewey caught and corrected a couple of chronological mistakes, among others.

Artist Virgil Finlay, however, failed on the critical interior illustration, picturing the Ship, to show the proper number—seven—of oars. All previous artists had oar trouble, and the jinx still has not been broken. However, Finlay's five brand new pen-and-ink pictures are so superlative in conception and execution that his "oarful" mistake can be more readily overlooked than the pun of the same name.

An acknowledged "classic", the plot of this novel is too familiar to bear repeating. A modern man is transported back sixty centuries to high adventure and high stakes on high seas in a fantasy of unparalleled beauty and power.

Alden Lorraine



BRASS TACKS

Perfectly correct! Now—wonder what ancient, nameless genius, not knowing the binary system, figured it out?

Dear Mr. Campbell:

I especially enjoyed your simple system of multiplication in the June issue. The only thing that ruined it was that "Why?" stuck on the end. It forced me to stay up half the night trying to figure the darn thing out. Finally out of sheer exhaustion, I came up with a fairly logical solution.

Here it is: the multiplication system is based on the binary system of numeration. (The numerical system using only two digits, 1 = 1 2 = 10 3 = 11 4 = 100 etc. See pp 94-95 May 1949 issue of ASF.)

Take a simple multiplication like 9 X 6 for instance. Now, set the problem up in the two columns and proceed according to directions, dividing the smaller by two and multiplying the larger by two the same number of times. The division of the smaller number really converts it to the binary system. The odd number = 1; the even = 0(1). Then converting the other column to the binary system, you have a form of binary multiplication. (2)

(1)	6	0		
	3 =	1	6 = 110	9 = 1001
	1	1		
				1001
				X110
(2)	0 X	1001		= 000000 = 0
	1 X	1001	X 10(2) =	1001(0) = 18
	1 X	10010	X 10(2) =	1001(00) = 36
				110110 = 54
	a		b	c

It can be seen that the multiplication of columns a and b results in the same addition as with the regular binary multiplication (c). Some way to multiply!—Frank Raasch Jr., Kearney, Nebraska.

Strictly for the Math sharks!

Dear John:

Several readers have expressed a desire for some problems or puzzles. Here is one that may afford some entertainment, and the answer is startling indeed!

A rocket takes off with an initial horizontal velocity of 500 miles per hour and an initial rate of climb of 1,000 feet per minute. With each 1,000 feet of altitude its velocity increases 10 mph, and each 100 mph faster it goes the rate of climb increases 100 feet per minute. Where is the rocket in 200 minutes?—Douglas B. Netherwood, Capt., USAF, Electronics, Hq. SAC, Offutt Air Force Base, Omaha, Nebraska.

Mass hysteria does *happen!*

Dear Mr. Campbell:

John D. MacDonald's story, "Trojan Horse Laugh", reminded me of an experience I had while in an army ordnance unit just outside Rosario, Luzon.

We had an outdoor arena for the projection of movies, the center portion of which was screened off with chicken wire to keep the civilians from occupying seats reserved for the troops. Around this barrier, the Filipinos would gather in hordes and stand quietly and patiently throughout the hour-long show.

One evening, something—we never knew what—startled a small knot of civilians at the extreme left of the inclosure and they started to run, encountering in their flight the larger body of Filipinos gathered about the projection booth. The air was soon filled with dust and the sound of hundreds of bare feet thudding into the earth.

Inside the inclosure, someone in the front row leaped up to join the exodus and, in a moment's time, the whole area became the scene of a wild retreat, soldiers and civilians mingling in their frenzied effort to get away from the spot. No words were spoken, no voices raised, but everywhere could be heard grunts and groans and the crash of falling bodies. Even the projectionists fled, leaving the projector running.

We were a bruised and sheepish lot when we finally straggled back to see the rest of the show. None of us had been frightened—it was just that everyone else had been running and we thought we had to run too—like sympathetic yawning.

Thus, when Alice and Joe were caught up in the hysteria of the city, even though they had had no injections, I was inclined to think the situation farfetched until I remembered that stampede in which I myself had taken part.

MacDonald's story was unusually good, as was the rest of the issue. Let's have more like it.—Joe E. Dean,

315 West 33rd Street, New York, New York.

Well, we purr happily anytime someone does repeat it. Rumors to the contrary notwithstanding, I am *human.*

Dear Mr. Campbell:

Since you asked someone to check Art Kalaugher's figures, I accepted your challenge, and found that it was wrong. The correct value of π in the binary system is: 11.0010010000-1111110110101010001000100001010-10100011. If any of the readers of ASF have any use for it, I shall be glad to compute forty more places on it.

I enjoy Brass Tacks very much, especially the mathematical problems that some readers have. My only suggestion is that I think most of the editor's comments would be a lot better after the letter than before. And incidentally, are you convinced that you have a very good magazine, or do I have to repeat it too?—Gary D. Gordon, Wesleyan Station, Middletown, Connecticut.

Correction! He's quite right—but even if liquid air didn't reach hydrogen's JTIT point, hydrogen expanding in an engine, doing mechanical work, would still be cooled, and cryogenics would then cry for a good lube-oil effective at —200° C.

Dear Mr. Campbell:

I should like to call attention to a slight error in an otherwise excellent article: that entitled "Parboiled Pilots" in the August, 1949, issue. On page 5 is stated: "*Any* means of expanding compressed air cools it . . .". (The italics are yours.)

It is a little-known fact that any gas upon expanding may either heat up or cool down, or even do both in the same operation, depending upon the nature of the gas, the temperature at which the operation started, and the extent of the expansion. Below a certain temperature called the Joule-Thomson inversion temperature—different for each gas: —83° C for hydrogen; much higher for most gases—gases do indeed cool down upon expanding, as you state, but above this temperature, astonishingly enough, they heat up. The attainment of the extremely low temperatures around absolute zero is dependent on the fact that liquid air can cool hydrogen below its inversion temperature, whereupon expansion can cool it further; the resulting liquid is then used for cooling helium below its inversion temperature. If air liquefied at a temperature above Hydrogen's JTIT, cryogenics would be crying indeed.

Further information may be found in any book of thermodynamic or advanced physical chemistry, e. g., S. Glasstone, "Chemical Thermodynamics," (D. Van Nostrand).

It may be splitting hairs, but you *did* use italics on the word "any"! I just want to set the record straight. Please accept my congratulations on the remainder of the article. Popu-

larizing technical data is not easy to do without making inaccurate simplifying generalizations or else becoming tedious. You have done an excellent job.—Crayton M. Crawford, 306 Russell Avenue, Greenville, South Carolina.

Sure we've been prejudiced in favor of the Navy! What do you expect when all the top authors are Navy or ex-Navy men? Heinlein—Hubbard—the late Jameson—all helped establish the tradition!

Dear Sir:

Before I indulge in criticism, I would like to say that as a less than ardent fan of science fiction, I believe your magazine is of the best quality. Your stories seem to be much more logical and scientifically substantiated than the usual run of science fiction, which usual run usually runs into nausea. I am science editor for our local paper here at the University of Texas, have had a more than average amount of training in science and I think I may speak with some authority.

Now for the criticism. Happily, the criticism I have in mind does not refer to the logic used by your authors or the basis of your stories in science. Rather, it has to do with certain implications as regards the present controversy in the Armed Forces. Certain men in both the Navy and the Air Force are looking

forward, rightly enough, to space travel. These men also seem to take it for granted that their own branch of service, viz. the Navy or the Air Force, will be the one to take over the military duties of patrolling the spaceways, or whatever might be required.

I have yet to read a story in your magazine, in which any particular branch of service now in existence is mentioned in connection with space patrolling, which gives the Air Force credit. All others of this type either had the Navy, of all things, sailing through the waterways of space, or the job was assigned to an independently created unit specializing solely in space travel, which of course is more logical. It would seem to me, if it were a question of handing this future job over to the Navy or Air Force, the latter would be the most logical choice. The Navy traditionally steers its course on a two-dimensional plane, while the Air Force by its very nature must constantly operate in a three-dimensional plane. Of course, it is not necessary that any future space travel, if any, be assigned to any existing service. It would be more logical and a lot simpler to create a special, independent rocket force.

It seems to me, from the stories I have read recently, that either you or your writers are prejudiced in favor of the Navy. Even the rocket forces of alien peoples many light-years away have signed away their rocket forces to the local navies. I will admit the vast possibilities that I may be wrong in my assumptions, and I only hope I am. I did not start reading your magazine until the first of this summer of 1949.

Whether you wish to publish this in your letters to the editor column is of no import to me. What I would appreciate is a letter stating your policy on this subject, if you have made one.—Robert L. Smith, 200 E. 22, Austin, Texas.

"When there isn't room for more wires—use wireless!"

Dear Campbell:

The September issue's article "Cybernetics," by E. L. Locke tempts me to draw a few speculative conclusions in another direction from those he deemed mentionable. Perhaps the reason I've never thought of it before was that I hadn't quite suspected the possible relativity.

The single paragraph which hit the spark, however, occurred on P. 89 when Locke said that—as shown by Weiner—*the number of cells go up as the cube of the brain dimension while the connectors go up only as the square.* I'd heard before that the remote parts of the brain are affected first when there's a mental monkey-wrench loose in the works. Of course, Locke was considering primarily the functioning of feedback loops—but I was reading Astounding SCIENCE FICTION, wherein any mention of the brain is likely to be on the extreme view of developed

Extra-Sensory Perception and/or Psycho-Kinesis!

Immediately, I laid Locke's article down for an instant and took off on my own speculations as to why we reputedly use only nine-tenths of the brain and why, as he says, the brain is apparently too large for efficiency already. I was considering a normally healthy brain, of course; psychotic brains are no more attractive to me than polio or cancer.

Now why, I mused, *is the brain so darned inefficient?* Well, maybe it isn't! I remembered how other parts of the human machine were considered inefficient until more was learned about their purposes and limitations, and the final conclusion seemed invariably that their only major inefficiency was man's ignorance. But here was, it seemed, undisputable physical evidence of the contrary, evidence that we're actually lugging around more brains than we could ever use!

Why should there be so few connectors? For engineering purposes, nature obviously had to accept some limitations—but Ol' Momma Nature is fiendishly adept at sidetracking limitations! Now, why couldn't it just happen to be that she had stuck in another entirely different system of communications when she made human brains, to compensate the necessarily few physical line-connectors? Something, say, so far out

of this world that it involves a few entirely new frequency bands and a few centuries' development of subatomic research before its physical presence is even suspected? In other words, maybe a built-in equalizer?

That suggested something else: anything that far "out of this world" would prove difficult for the brain itself to utilize! The communications received from such a system might conceivably be a tricky code that the brain would have trouble deciphering unless its physical structure was hitting peak efficiency! Good physical health and mental awareness.

Are you still with me? O.K., the next point was—in my chain of speculations—that here, perhaps, was the theoretical explanation of ESP and PK powers, the neutrinos of the mind. Rhine's experiments concluded that such powers were at their best when the subject was physically relaxed, mentally rested, and alert to the circumstances of the test. *Ping*—the conclusions dovetail!

Being Science Fiction enthusiasts, we next consider if and how these conclusions might point the way toward telepathy, tendrils, and the Gray Lensmen.

Obviously, we'll have to go a long way farther toward something resembling a good definition of the word "civilization" before: (A) the human race is physically in such good shape that we aren't bothered with such things as colds, rheumatism, fevers, chills, and whatnot, which are distracting; and (B) we're free of such pathological worries as keeping up with the Joneses, keeping our jobs, getting a home and making enough money to pay off loans, mortgages, installments, and the other little whatnots that form the structure of modern living, such as taxes. It is even too much worry, as yet, remaining compatible with the little woman so as to raise a fine, strong family of red-blooded young Americans. We'll have to get all these items off our neural patterns before we're mentally healthy enough to tackle ESP and PK code-messages with a vengeance!

A bit of supporting evidence, here, is that most cases of "mysticism" generally originate in the backwoods of this planet. There's something like a psychic accord between man and nature that considerably helps the subject attain mental accord, it seems. The extreme examples, of course, are the voodoo rites and Asiatic occult Mumbo Jumbo which, in successful cases such as a casual stroll upon hot coals, show that the subject must be jarred, shaken, or otherwise lulled into a semi-conscious or totally unconscious hypnotic trance. Otherwise, his neurons are too occupied with everyday trivialities to concetnrate on ESP-PK code-messages. What the hypnotic trances do to his conscious rationalization is something for the psychologists to study.

But considering the present trend

of social evolution, will such a civilization ever be realized? I think it will *have* to be realized if anything galaxy-wide is to be established. It seems possible that somewhere along the line a peak will be reached without benefit of political empires and ideological wars, a peak which will collapse from the weight of accumulated gimmicks of civilization rather than mass revolt against tyranny. O'Donnell came close to describing it in his novel "Fury," and Williamson laid a possible background for it in his "The Equalizer," though the latter had a totalitarian-proletariat conflict. It might conceivably involve the attainment of immortality, or virtual immortality. But once it is realized, the pathological reaction to the collapse might be the thing which awakens the mental consciousness to the gimmick-free possibilities of ESP and PK practices. In other words, it might be effected in an historic moment when the impetus of mass-psychology fell in its direction. If Van Vogt's "Centaurus II" had led to the climax of Williamson's "The Equalizer"—that might suggest the required circumstances.—Joe Gibson, 24 Kensington Avenue, Jersey City 4, New Jersey.

IN TIMES TO COME

In Times To Come doesn't ordinarily refer back to previous issues, but since some readers didn't spot the little game we were playing with the November 1949 issue, I will make the exception, and point out the letter of Richard Hoen, in our November, 1948 issue. That November issue took a high degree of co-operation from the authors; it isn't easy to write a yarn to a title specification, and I want to thank them for a fine job well done.

With which we jump four months forward to the February 1950 issue, with a brief pause to note *en passant* that this January issue marks Astounding's twentieth birthday. (Next year we come of age!) But we're starting a new serial in February, "To The Stars," by L. Ron Hubbard. It's a two-parter, and a beautiful development of the theme based on the time-rate differential of ships traveling near the speed of light. Of a man shanghaied aboard a ship half a millennium old, for a trip that leads not only to the stars, but across millennia of time. In Space, the ships can move out and back, but it's a one-way road in Time, when you make The Long Trip, and the crews of the ships are strange gatherings of men from across the ages!

H. Beam Piper is back, too, with an interesting idea. Once, when the winning of wars depended on swordsmen, archers, and cavalry, there were mercenary companies, that sold their training to the highest bidder. Today, more and more, wars are won or lost by science—and a scientific team. The story is titled "The Mercenaries".

Provisionally scheduled for February—possibly crowded over to March—are stories by Van Vogt, Kuttner, Poul Anderson, H. B. Fyfe, and a returning old-timer, Cleve Cartmill.

THE EDITOR.

THE ANALYTICAL LABORATORY

Because there were seven stories in the October, 1949 issue, the point scores inevitably run higher than usual. Because there was considerable disagreement as to just which yarn merited first place, the scattering of point-votes made the scores come out high on the first few places, too. And it's well worthy of mention that a short story—"Production Test"—succeeded in making second place despite the fact that experience shows novelettes have a big advantage in the voting.

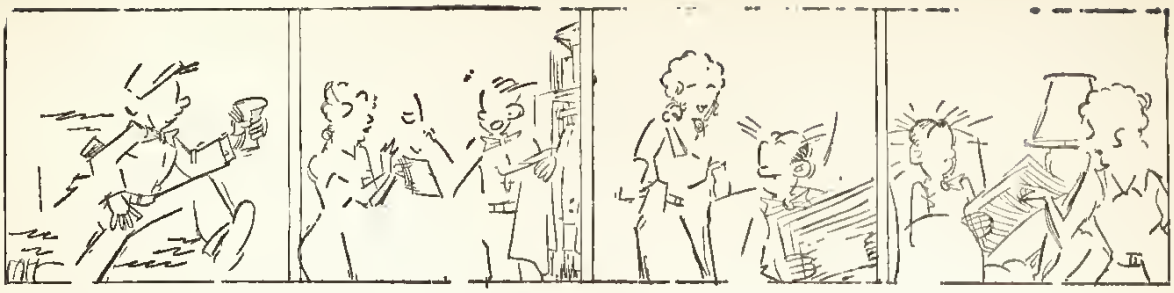
Incidentally, next month's scores should be very interesting! We had considerable fun fixing up that November issue that way!

However, here are the standings for the October, 1949 issue:

Place	Story	Author	Points
1.	The Automagic Horse	L. Ron Hubbard	2.71
2.	Production Test	Raymond F. Jones	3.00
3.	The Aristocrat	Chan Davis	3.13
4.	Time Heals	Poul Anderson	3.75
5.	Defense Mechanism	Katherine MacLean	4.14

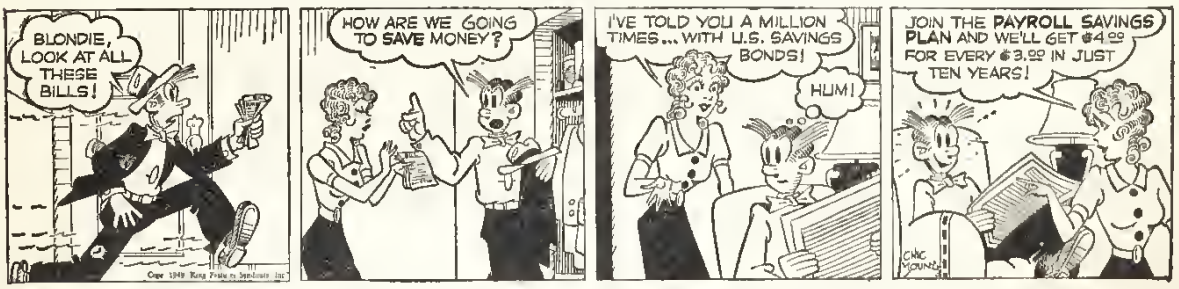
So, gentlemen, have you voted. Incidentally, if you haven't the time and/or energy for a letter, a penny postcard gets your opinion properly scored on the tally. What you think of the stories will, of course, have no influence on my choice of material—unless you communicate that opinion!

THE EDITOR.



This is how Chic Young, the cartoonist, makes a first rough sketch for the famous strip.

Then when each panel in a strip meets his approval, he makes a careful pencil rendering as above.



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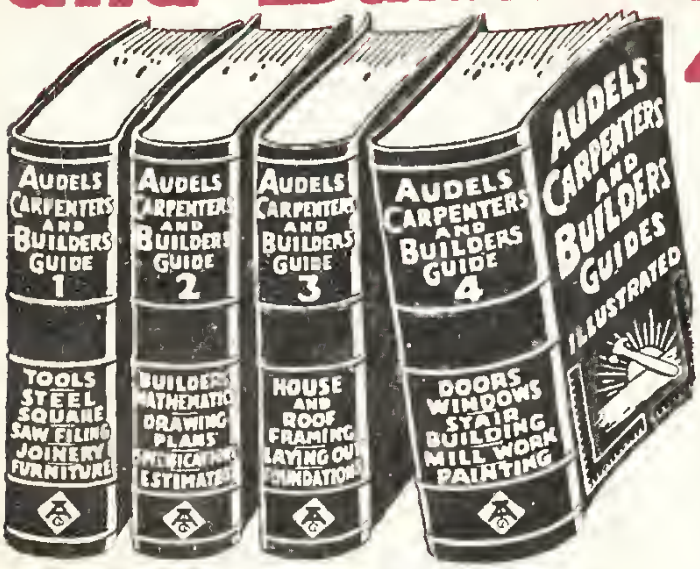

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